

PART I.

THE ORGANS OF VEGETATION.

ROOTS.

THE *Radix*, or *Root*, is the lower part of the vegetable, which, from being generally attached to the earth, derives from thence various nutritious principles, which it conveys to every part of the plant; it also performs the important office of retaining the plant in a fixed position.

The principal divisions of the root are those denominated *Caudex* and *Radiculæ*. By the term caudex, Linnæus means the main body of the root; and by radiculæ, the stringy or fibrous parts, which, in the greater number of vegetables, terminate the main root, and are especially concerned in absorbing nourishment from the earth. The caudex consists of two parts: the *Caudex descendens*, or descending caudex, which strikes downward, and throws out radicles, or small fibres; the *Caudex ascendens*, or ascending caudex, which is that part of the root raising itself above the ground and ultimately becoming the stem.

The minute extensions, termed *Radiculæ*, may also be called *Fibrillæ*; and, on the authority of Professor Link, the young roots of mosses and lichens may be termed *rhizina* and *rhizula*.

FORM.

Roots in respect of their form are:—the *Radix fibrosa*; *Radix fusiformis*; *Radix tuberosa*; *Radix præmorsa*; *Radix granulata*; and the *Radix bulbosa*.

The *Radix fibrosa*, or fibrous root, consists principally of a number of fibrous radicles, each of which is more slender than the base of the trunk or stem to which it is attached.

The *Radix fusiformis*, or spindle shaped, otherwise tap root, is a species of root tapering to a point; the radicles, or fibres, are generally disposed over the whole surface of the principal root.

The *Radix tuberosa*, or knobbed root, is a hard and fleshy root, and generally thicker than the base of the stem to which it is attached. It consists either of one knob or of several, formed by filaments into a bunch: such tuberous roots as throw out their radicles at the top from a knob formed between the stem and the root, are called *Radices comosæ*,* from the fibres resembling a tuft of hair.

* *Coma*, a bush or head of hair.

The *Radix præmorsa* is a species of root which does not taper, but ends abruptly. Hence, it is not improperly called the bitten root.

The *Radix granulata*, or granulate root, consists of several little tubers, or fleshy knobs, which resemble grains of corn.

The *Radix bulbosa*, or bulbous root, has given rise to much dispute, and it is important to attend to the structure of it, as it frequently affords the only means of distinguishing one species of plant from another of the same genus. Thus, the different species of the genus *Scilla*, or squill, can hardly be distinguished from each other, except by the character of their bulbs, which are coated, deemed solid, and sealy.

This form of root is, perhaps, more properly speaking, a large bud, situated under ground; it encloses and protects the future plant, several generations of which lie enveloped in it, until they are unfolded by the action of water or other alimentary stimulus. To illustrate this view of the subject it may be proper to observe, that Linnæus does not consider the bulb as a part of the root, but as the Hybernaculum, or winter quarters of the plant. From the lower part of the bulb extend the fibrous appendage by which the plant is attached to the earth in which it grows, and which are so many absorbing vessels, through which the necessary alimentary matters

are conveyed. These *Radiculæ* Linnæus regards as forming the true root. From this opinion there are, however, many dissensions, and amongst them was the Marquis de St. Simon, who, in his work on Hyacinths, printed at Amsterdam, 1768, asserts that the radicles, or cylindrical fibres, of certain bulbus-rooted plants, such as the *Hyacinth*, were by no means necessary to their full growth and perfection; he deduced this conclusion from certain observations which shewed that the radicles exercised an exhaling, rather than an absorbing action. Without determining between the Marquis and Linnæus, the student may be safely recommended to examine for himself the five different kinds of bulbs, as described by Linnæus, viz. *Bulbus squamosus*; *Bulbus solidus*; *Bulbus tunicatus*; *Bulbus articulatus*; and the *Bulbus duplicatus*.

The *Bulbus squamosus*, or scaly bulb, consists of a number of imbricated lamellæ, or thin plates, which are laid over each other somewhat in the manner of scales on a fish.

Many species of Lilies furnish us with examples of this beautiful kind of bulb.—EXAMPLE, Fig. 6, Plate 1.

The *Bulbus solidus*, or solid bulb, apparently consists of one solid and fleshy substance, and Linnæus offers the Tulip as an exhibition of this kind of bulb; but, on a minute examination,

it evidently is a truecoated bulb. Professor Ludwig has adduced the common *Crocus* as an example of the solid bulb; but even this, upon a careful inspection, appears to consist of a number of tunics or coats, the exterior ones of which spontaneously separate from one another; and the internal ones, though thicker, are easily divided. It is, therefore, a matter of question, whether a true solid bulb, in Linnæus's sense of the word, exists.

The *Bulbus tunicatus*, or coated bulb, consists of a number of tunics, or coats, which are regularly laid over each other. The common onion, the amaryllis, and very many other plants, furnish instances of this species of bulb, the coats of which are frequently so thick and succulent that they are sufficient to make the plants vegetate, without the aid of mould or water. Instances often occur when the officinal squill, as it lies in the shops of the druggists, may be seen protruding both vigorous stems and flowers.—EXAMPLE, Fig. 1, Plate 1.

The *Bulbus articulatus*, or jointed bulb, consists of lamellæ, which are linked or chained together, as in the *Lathræa squamaria*, or toothwort; the *Adoxa moschatellina*, or Tuberous Moschatel; the *Dentaria bulbifera* of the British Flora, and the *Martynia perennis*, a native of South America.

The *Bulbus duplicatus*, is a name applied to certain roots which have two bulbs connected together. Some species of Orchides furnish us with the best examples of this kind of root.

Where two bulbs are thus united, it is commonly observed, that one of them is light, empty, and swims on the surface of the water; whilst the other, which is partially solid, sinks by reason of its weight. From the former, the plant of the present year has proceeded: the latter contains the bud of the future year.—EXAMPLE, Fig. iv., plate 1.

DIRECTION AND MANNER OF GROWTH.

The *Radix perpendicularis*, or perpendicular root, descends in one strait fibre, and gradually tapers from above downwards.

The *Radix horizontalis*, or horizontal root, extends itself under the surface of the ground, nearly in a horizontal direction. The English *Iris pseudacorus* (common Flower de Luce), the *Humulus lupulus* (Hop), and the North-American May Apple (*Podophyllum peltatum*), furnish us with examples of this direction of the root. Some of the horizontal roots run very near the surface, such as the woodbine and the wild anemone; others run lower, as the *Friticum repens* (couch grass).

The *Radix repens*, or ereeping root, is distinguished from the horizontal root, to which, however, it is nearly allied: while the latter species of root is extended under the earth, in a transverse direction, the former is observed to creep horizontally in every direction, putting forth fibres as it proceeds. The *Mentha*, or mint, furnishes examples of this kind of root.

The *Radix ramosissima*, is a root which is greatly subdivided, or which branches to a considerable degree.

The *Radix ramosa* is an ordinary branched root.

The *Radix simplex*, or simple root, will require no explanation.

Some roots have a two-fold direction; thus, in the *Primula* (primrose,) the main root runs level, and the radicles and fibres strike perpendicularly into the earth.

EXPLANATION OF PLATE 1.

Fig. 1. The bulb (bulbus, *Radix bulbosa*,) of the beautiful Atamasco lily (*Amaryllis atamasco*.) A. The bulb. B,B. Two off-sets or suckers, from the lower end of the bulb. C. The radicle (radicula) or fibrillæ.

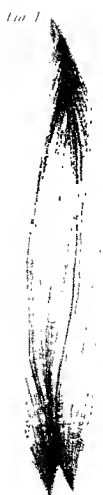
Fig. 2. A transverse section of *Fig. 1*, to show its tunicated structure, a, b. Two eyes, or places from whence proceed the flowers. c. The radicle or fibrillæ.

Fig. 3. The root of the *Fumaria cucullaria*. A,A. Two bulbs. b, b. Small succulent scales, protecting the lower parts of the bulbs, each of which is capable of becoming a perfect plant.

Fig. 4. The ophrys hyemalis. A,B. The two principal bulbs, constituting the *Bulbus duplicatus*. C,C. The fibrous portions of the root. D. The radicle or fibrillæ. E. The plicated or folded leaf (*Folium plicatum*.)

Fig. 5. The root and a portion of the stem of the beautiful *Limodorum tuberosum* of Linnæus, (*Cymbidium pulchellum* of Swartz.) A,A. The radicle or fibrillæ. B,C. Two small suckers.

Fig. 6. The scaly bulb (*Bulbus squamosus*) of the *Lilium superbum*. A. The radicle or fibrillæ. B. The scaly portion.





EXPLANATION OF PLATE 2.

Fig. 7. The root, &c., of the *Veratrum luteum* of Linnæus. It is a good exhibition of the premorse root (*Radix præmorsa*.) A. The extremity of the root, which appears as if it had been bitten off. B. The radicles or fibrillæ. C. Portions of the leaves, which are all radical (*Folia radicalia*) in this plant.

Fig. 8. The fusiform root (*Radix fusiformis*) of the wild carrot (*Daucus carota*.) A,A. The main body of the root, or the descending caudex. B,B. Mark the commencement of the ascending caudex or stem.

Fig. 9. The root of the *Tuberus Moschatel* (*Adoxa Moschatellina*.) A. A shoot proceeding from the root. B. Continuation of the same, but detached.

Fig. 10. Creeping Crowfoot (*Ranunculus repens*.) A,A. The stem. B,B. Radicle or fibrillæ, proceeding from the bosom of the leaves.

Fig. 11. The horizontal root (*Radix horizontalis*), of the May apple (*Podophyllum peltatum*). A. The ascending caudex, or a portion of the stem. B,B. b,b. The main body of the root, as it creeps or spreads in a horizontal direction under the ground. C,C,C. Fibres proceeding from the main root.

THE STEM.

The Stem has been called *Caudex ascendens*, *Caudex intermedius*, *Culmus truncus*, *Truncus ascendens*, and by many other names. It is invariably composed of a bundle of vascular and woody tissues, embedded in cellular substance in various ways, and the whole covered by a cuticle.

In the true sense of Linnæus, the stem is to be considered as only a part of the herb (*herba*), and which he defines to be that part of the vegetable which arises from the root, is terminated by the organs of fructification, and comprehends the Trunk, the Leaves, the Fulcres, and the Hybernacle.

The Trunk (*truncus*) is the body or main stem of the vegetable, whether it be a tree, a shrub, or an herbaceous plant. It supports the leaves and the fruit, and, according to circumstances, marks the character of the plant; for example: when a trunk bears permanent or perennial branches, the plant is termed a Tree;* when permanent branches arise, not from a trunk, but from the root, the plant is termed a Shrub;†

* Latin, *Arbor*.

† *Frutex* or *Arbustum*.

when the branches are small and numerous, a Copse Shrub;* when a plant is furnished with woody branches that are not permanent, as in tree mignonette, it is termed an Under Shrub;† and when the stem is not woody, and dies down every year as far as the crown of the root, the plant is called a Herb;‡ and when a trunk is formed, like the underground stems of the iris, of the hardened bases of leaves which have withered and fallen, and is not tapered, but of a uniform thickness, giving off no branches, as in the date and cocoa, the plant is termed a Palm.||

Linnaeus enumerates seven species of trunk, viz.: the *caulis*, *culmus*, *scapus*, *petiolus*, *pedunculus*, *frons*, and *stipes*.

The *Caulis* stem or stalk is, as has been already observed, the body of any herb or tree supporting branches, leaves, and fruit. Dr. Milne says that the *caulis* is an universal trunk; that is, it proceeds immediately from the root, whilst the foot-stalks of the flower and leaf, which Linnaeus likewise denominates Trunks, are partial; proceeding as they frequently do from the universal trunk, or its branches.

The *Caulis* is either simple, simply branched, or compound: simple, when undivided to the

* *Dumus*.

† *Herba*.

‡ *Subfrutex*.

|| *Palma*.

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summit; simply branching, when not divided from the crown of the root; and compound, when subdivided into *ramuli*, or small branches, diminishing as they ascend, so as frequently to lose the appearance of a stem.

Linnæus enumerates the following varieties of the *Caulis simplex*, or simple stem.

Caulis nudus, a stem without leaves or hair.

Caulis foliatus, a stem covered with leaves.

Caulis flexuosus, a stem which takes a different direction at every joint.

Caulis volubilis, a stem which ascends in a spiral direction, or round the branch, stem or prop of some other plant.

Caulis reclinatus, a stem reclining in an arch towards the ground.

Caulis procumbens, a stem lying along the ground, but not putting forth roots.

Caulis repens, a stem running along the ground, and throwing roots at certain distances.

Caulis sarmentosus, a slender stem having leaves in branches only at the joints where it strikes root.

Caulis parasiticus, a stem which does not grow immediately from the ground, but depends for its support upon some other plant.

Caulis teres, a columnar stem, or stem without angles.

Caulis anceps, a two-edged stem, compressed, and forming two opposite angles.

Caulis triqueter, a stem having three plane or flat sides.

Caulis trigonus, a stem having three angles, with the sides concave or convex.

Caulis sulcatus, a furrowed, grooved, or fluted stem.

Caulis striatus, a stem marked throughout its whole length, with superficial or slight grooves or channels.

Caulis glaber, a smooth stem.

Caulis scaber, a rugged stem.

Caulis villosus, a stem covered with down.

Caulis hispidus, a stem covered with bristles or minute prickles.

Of simply branching stems, there are the following kinds:

Caulis ascendens, a stem, the branches of which grow at first in a horizontal direction, and then gradually curve upwards.

Caulis diffusus, a stem furnished with spreading branches.

Caulis distichus, a stem with the branches horizontal, and produced in two rows.

Caulis brachiatus, a stem having branches,

stretched out like arms, in pairs, each of which are at right angles with the next.

Caulis ramosissimus, a stem very much branched, and having the branches disposed without any regular order.

Caulis fulcratus, a stem supported by the branches, which descend to the root; as in the Fig-tree and the Rhizophora, or sea mangrove.

Caulis prolifer, a stem which puts forth branches only from the centre of the summit; as in the Pine, Fir, and Cedar.

Caulis simplicissimus, a stem of the most simple growth, having very few branches, and which proceed in a straight line to the top, as in the Lathræa, Squamaria, or Tooth-wort.

Of the *Compound Stem*, or *Caulis compositus*, Linnæus mentions three species, viz.—

Caulis dichotomus, a stem which is regularly divided by pairs, from the top to the bottom; as in the Viscum or Mistletoe.

Caulis subdivisus, a stem divided into branches irregularly and without order.

Caulis articulatus, a jointed stem, having joints or knobs at regular distances.

Culmus, which may be very properly rendered culm, straw, or haulm, is defined by Linnæus to

be the proper trunk of grasses, which support the leaves and fruit; Professor Martyn prefers the term *culm* generally; the term straw, can perhaps only be properly applied to the dry stalks of corn. There is a general feature in this species of stem; it is usually tubular, or hollow, and sometimes triangular, and has very frequently knots or joints at regular intervals.

When jointed, it is called *Culmus articulatus*; when free from joints or knobs, *Culmus enodis*. The interval or space between each two joints of a jointed culm, is termed an internode, agreeably to Professor Martyn.

In the greater number of grasses, the culm is furnished with leaves, as in wheat, rye, Indian corn, &c.; in some, the culm is entirely leafless, as in certain sheaves of cypress grass.

The Scapus,* or scape, is a species of stem or trunk which supports the fruit but not the leaves; and, like the caulis, is an universal stem; in this respect it differs from the pedunculus or peduncle. The scape proceeds immediately from the root, whereas the peduncle issues always from the stem, or branches of the stem. The scape likewise differs from the *Caulis aphyllus*, or leafless stem, in having radical or bottom leaves.

Examples of the scape are to be seen in the

* Latin, the shaft of a column.

cowslip, narcissus, pyrola or winter green, convallaria majalis, or lily of the valley, hyacinth, dionæa muscipula, sarracenia purpurea, hypoxis erecta, and the sagittaria folia.*

The *Petiolus* or *petiole*, is the *leaf-stalk* or *foot-stalk*; it is also called a *fulcre*, from the support it gives to the leaf; and it is, of course, the part connecting the leaf with the main stem. In the generality of plants it is nearly of the same colour as the leaf to which it belongs; indeed it has the appearance of the leaf in a compressed state, its upper surface being flattened, the under round or convex. It consists of one or more bundles of fibrovascular tissue, surrounded by cellular tissue; its figure is generally half-cylindrical, frequently channelled on the surface; in most monocotyledonous plants it is perfectly cylindrical.

At the base of the petiole, where it joins the main stem, there is generally produced a protuberance, which, by RUELLIUS and LINK is called the *pulvinus*, but the term *coussinet*, given it by M. de CANDOLE, is preferable.

At the opposite extremity of the petiole, where it is connected with the leaf or lamina, a similar increase is often visible, as in *Sterculia*, *Mimosa sensitiva*, and others; this is termed *Struma*,

* For example, see Plate 16, class 22.

and by De Candole and other French botanists, *Bourrelet*. The petiole is generally straight, but in some cases rigid and twisted, so that the plant can climb by it. Occasionally it embraces the branch from whence it springs, and it is then said to be a sheath, as in the grasses. When the lower part only of the petiole is sheathed, as in Umbelliferæ, that part is with propriety called the pericladium. This division of the plant sometimes supplies us with very elegant marks for discriminating the different species of a genus: the *Petiolus alatus*, or winged petiole, is a species of leaf-footstalk, which has a thin membrane or border on each side of it; this little characteristic distinguishes the *orange* (*Citrus aurantium*,) from the *lemon* (*Citrus medica*).

In the latter species the petiole is linear; that is, it is nearly of the same breadth its whole length.

In the greater number of vegetables, the leaves and fruit are supported by distinct foot-stalks, but in a few cases, the same foot-stalk supports alike the leaf, and the flower or fruit; this is the case in *Turnera ulmifolia*, and in *Hibiscus moscheutos*.

The **PEDUNCULUS**, or peduncle, is that part of the stem supporting the fruit without the leaves. The term is only practically used to denote the immediate support of a single flower, and is therefore confined to that part of the

inflorescence which first proceeds from the stem; it may, however, with propriety be applied to all parts bearing flowers without leaves, that is, not producing perfect leaves, for the peduncle is distinguished from every other kind of stem by producing the *bractæ*,* an imperfect leaf both as to size and figure.

Various species of the peduncle are enumerated by Linnæus; the principal of which are subdivided in the following manner:

The *Peduncle*, as to its place of *origin*, is called *Caulinus*, proceeding from the stem.

Rameus, proceeding from a branch.

Petiolearis, proceeding from the petiole.

Cirrhiferus, proceeding from a tendril.

Terminalis, terminating, or proceeding from the top of the stem.

Axillaris, proceeding from the axil, or angle made by the leaf and the stem, or by the branch and the stem.

Oppositifolius, opposite to a leaf.

Lateriflorus, having the flower on the side of it.

Interfoliaceus, among the leaves.

Intrafoliaceus, within the leaf.

Extrafoliaceus, without or on the outside of the leaf.

* See *Bractæ*, under the head of *Fulcres*.

Suprafoliaceus, inserted into the stem, higher than the leaf.

In respect to their *situation*, Peduncles may be *Oppositi*, opposite to each other.

Alterni, alternatc.

Sparsi, scattered, without any regular order, and *Verticillati*, in whorls.

As to their *number* they may be either *Solitarii*, single, or *Geminati*, double, in pairs.

The *peduncle*, according to the *number of flowers* it bears, is called

Uniflorus, onc-flowered.

Biflorus, two-flowered.

Triflorus, three-flowered.

Multiflorus, many-flowered.

In regard to its *direction*, a Peduncle may be *Appressus*, pressed close to the stem.

Erectus, upright.

Patens, spreading.

Cernuus, drooping, or pointing to the ground.

Resupinatus, upside down.

Declinatus, bowed, or curved downwards.

Natans, nodding.

Adscendens, rising gradually.

Flaccidus, weak or feeble, bending with the weight of the flower it supports.

Pendulous, loose, tending downwards with the leaf.

Strictus, stiff and straight.

Flexuosus, bending readily, in different directions.

Retrofractus, bent backwards, as if broken.

With respect to its *length*, it is

Brevis, short.

Brevissimus, very short.

Longus, long.

Longissimus, very long.

As to its *structure*, it is

Teres, round, cylindrical, or columnar.

Triqueter, three-sided.

Tetragonus, four-cornered.

Filiformis, like a thread, or of the same thickness in all the parts.

Attenuatus, tapering gradually towards the top.

Incrassatus, growing gradually thicker towards the top.

Clavatus, club shaped.

Nudus, without bractes.

Squamosus, scaly.

Bracteatus, furnished with bractes.

Articulatus, jointed.

Geniculatus, bent at the joints.

The *Frons*, or frond, is the sixth species of trunk recognised by Linnæus. He defines it to be a kind of stem, which has the branch united with the leaf, and frequently with the fruit.

The *Stipes*, or stipe, is, by Linnæus, said to be the base of the frond.

Both the Frons and the Stipes, (the former particularly,) belong to the ferns and palms, and as these do not strictly come within the plan of this work, all that is necessary to be said of them will be found to follow the illustrations of the 24th Class, Plate 18.

The term stipe, however, is by Linnæus partially applied to the foot-stalk, which, in many of the compound flowers belonging to the class of Syngenesia, is a species of trunk, elevating the feather-like crown, (called Pappus,) with which the seeds are furnished, and which connects it with the seed. This is sufficiently conspicuous in the *common Lettuce*, the *Leontodon Taraxacum*, (Dandelion,) the *Tus. ilago*, (Colts-foot,) and many other plants.

OF THE LEAVES.

A knowledge of the leaves of plants is an important part of the study of Botany. Nature appears to have taken delight in giving to them forms almost innumerable. It is from the leaves that some of the most eminent Botanists, particularly RAY, LINNÆUS, and VAN ROYEN, have taken the greater number of their specific characters of plants; and Linnæus lays it down as

an axiom, that the leaves exhibit the most elegant natural differences. This opinion, however, must be received with some qualification, for we find a variation of soil, or climate, or situation, to change considerably the aspect of the leaves of plants. Linnæus, too, has denominated the leaves the lungs of vegetables. We have, however, since his time made but little advance in the knowledge of their functions, and it is to be lamented that both LINNÆUS and HALLER were removed from their labours in this life* soon after PRIESTLEY, and other illustrious men, had turned their attention to the relations which subsist between vegetables and the atmosphere.

DR. ERASMUS DARWIN took much pains to prove, that the leaves are the lungs of vegetables, and that their offices nearly correspond with those of the lungs in man, and many of the lower animals. This opinion has been adopted by almost every botanist of eminence, and even by Professor LINDLEY. "Leaves," he says, "are at once organs of respiration, digestion, and nutrition; they elaborate the crude sap impelled into them from the stem, parting with its water, adding to its carbon, and exposing the whole to the action of air; and while they supply the

* Haller died 1777, and Linnæus in January 1778.

necessary food to the young fibres that pass downwards from them, and from the buds in the form of alburnum and liber, they also furnish nutriment to all the other parts immediately above and beneath them." He adds that there are many experiments to show that such is the purpose of the leaves. "If a number of rings of bark are separated by spaces without the bark, those which have leaves upon them will live much longer than those which are destitute of leaves. If leaves are stripped off a plant before the fruit has commenced ripening, the fruit will fall off and not ripen. If a branch be deprived of leaves for a whole summer, it will either die or not increase in size perceptibly." To these convincing experiments may be added one, made by the nephew of the late Dr. Darwin, and related in his *Principia Botanica*. He says, "If the spiracula of the leaves are stopped, by covering the upper surface with oil, death ensues."

OF THE ANATOMICAL STRUCTURE OF LEAVES.

The anatomical structure of Leaves is the subject which next claims attention.

The expansion of the vessels of the stem or stalk, forming several ramifications like network, are extended in length and breadth in a deter-

minate manner, having the interstices filled up with a tender pulpy substance, called the *Parenchyma*. The external covering is considered to be a continuation and expansion of the scarf-skin, or bark of the stem or stalk.

When a leaf is torn in a horizontal direction, we observe an exterior membrane, which is generally thin, and almost pellucid; this membrane is the bark of the leaf. It does not adhere to the subjacent parts with equal firmness in all plants; nor even on the two surfaces of the leaves in the same plant. It possesses the singular property, when first torn off, of quickly folding itself inwards; but when dry, of twisting in a contrary direction.

The bark of the leaf appears to be composed of an epidermis, properly so called, and a thicker substance, which may be denominated a cuticle; the bark is also furnished with a number of glandular bodies, which are of different sizes and forms; these glands are surrounded by fibres or small vessels; under this bark we find a beautiful network of vessels, connected with the cortical glands, and their circumambient vessels, which, whether they be arterics, veins, or absorbing lymphatics, are evidently a continuation of the vessels common to the stem and petiole; this network is known by the name of the cortical net of the leaf; and it is composed of a great number

of vessels, more or less minute, which, by crossing each other, forms its appearance. The forms of the spaces, or *areae*, between these thread-like vessels composing the net, are very different in different vegetables; and, indeed, in various parts of the same plant there is a perceptible variation in the form; they are more regular upon the upper than upon the under side of the leaf, and they are narrower and longer towards the petiole or foot-stem, than towards the middle and anterior part.

This beautiful, delicate, and regular net, is either single, double, or triple. These variations are exhibited in the following plants:

In the leaves of the Maple, the cortical net is single.

In the leaves of the Holly, it is double.

In the leaves of the Orange, it is treble.

Under the Cortical net, and in the areal interstices between the vascular fibres, we meet with another substance, which, as before said, has received the name of the *Parenchyma*, the pulp, or pith of the leaf: this substance is of a tender and cellular nature, but is by no means inorganic, or destitute of vessels; on the contrary, it distinctly appears to contain larger vessels than those which compose the cortical net; the areal interstices are larger also than those in the net (cortical). It is this pulpy substance which is so frequently

consumed by the myriads of insects which spread their ravages through our gardens, fields, and forests; leaving entirely, or in a very great measure, untouched, the cortical network. By allowing the leaves of plants to remain some days in water for the purpose of reducing the parenchymatous part to a more tender pulp, and afterwards pressing it out, we form those beautiful preparations of leaves which are so well calculated to exhibit the fabric of the cortical net.

Between the upper and under surface of the leaf there is a very essential difference. In the greater number of leaves, the veins and arteries are much more in relief upon the under than upon the upper surface; and, in general, the upper surface is of a deeper green. The entire surface of a leaf is called by Linnæus, *Discus*, or disk. In contradistinction, the upper surface is called *Discus supinus*, the under, *Discus pronus*. They are also termed *Pagina superior*, and *Pagina inferior*. The *apex* is the tip or end of the leaf, the most remote from the base; and the point where the base of the upper side of a leaf joins the stem, is called the *axilla*; any thing which arises out of that point, is said to be *axillary*. If a branch proceeds from above the *axilla*, it is called *Supra-axillary*; if from below it, *Infra-axillary*.

Ludwig, and some other writers, have distin-

guished leaves into primary and accessory. The primary are those which have been described; the accessory, those termed by Linnæus *Stipulæ* and *Bractæ*, and which will be considered under the head of *Fulcres*.

OF THE NOMENCLATURE OF LEAVES.

Leaves considered in respect to their nomenclature may be treated under the three following heads, viz.

Simple leaves, Compound leaves, and leaves according to their Determination.

The *Folium simplex*, or simple leaf, is that species of leaf which consists of one undivided substance, situated upon a petiole, or foot-stalk. In other words, the simple leaf is one of which the petiole is terminated by a single expansion, and the divisions of which, however deep, do not reach to the middle rib. "To understand this, let it be observed, that the middle rib of every leaf is the principal prolongation of the foot-stalk; which, to form the membranous expansion, called the leaf, runs out into a number of ramifications, which, inosculating and crossing each other, jointly form the cortical net" of the leaf. "When these ramifications of the foot-stalk are so connected as to form one entire expansion,

the leaf is said to be simple; but when the middle rib becomes, in fact, a foot-stalk, and several expansions, instead of one, proceed from the common foot-stalk, the leaf is called compound." The middle rib of a leaf, whether it be simple or compound, is denominated by Linnæus, *costa*.

The forms of the simple leaf are almost innumerable. The majority of those enumerated by Linnæus in his *Philosophia Botanica* will be noticed; but it is impossible within the limits of an elementary work to attempt any thing like a full description of all. Among the most important to be noticed are the—

Folium orbiculatum, an orbicular or circular leaf.

— *subrotundum*, a leaf partially round.

— *ovatum*, an ovate, or egg-shaped leaf.

— *ovale*, an oval leaf.

— *parabolicum*, a parabolic leaf.

— *spatulatum*, a spatulate, or spatula-shaped leaf.

— *cuneiforme*, a wedge-shaped leaf.

— *oblongum*, an oblong leaf.

— *lanceolatum*, a lanceolate leaf.

— *lineare*, a linear leaf, as in the leaves of grasses.

— *acerosum*, an accrose leaf, or a leaf which is permanent, as in the Pine, Yew, and many other ever-green trees.

Folium subulatum, a subulate leaf; linear at the bottom, but gradually tapering to the end.

- *triangulare*, a triangular leaf.
- *quadrangulare*, a quadrangular leaf.
- *quinquangular*, a five-cornered leaf.
- *deltoides*, a deltoid leaf.
- *rotundum*, a round leaf.
- *reniforme*, a kidney-shaped leaf.
- *cordatum*, a heart-shaped leaf.
- *lunulatum*, a crescent-shaped leaf.
- *sagittatum*, a sagittate leaf, one shaped like the head of an arrow.
- *hastatum*, a hastate leaf, or one resembling the head of a halbert.
- *panduræforme*, a guitar-shaped leaf.
- *fissum*, a cleft-leaf, a leaf divided by linear sinuses, with straight margins; according to the number of which divisions, the leaf is called bifid, trifid, quadrifid, quinquefid, multifid.
- *lobatum*, a lobate or lobed leaf.
- *palmatum*, a hand-shaped leaf.
- *pinnatifidum*, a pinnatifid leaf.
- *lyratum*, a lyre-shaped leaf.
- *laciniatum*, a laciniate, or jagged leaf; a leaf divided almost down to the base. According to the number of the divisions, this parted leaf is called *bipartitum*, bi-

partite; *tripartitum*, tripartite; *quadripartitum*, quadripartite; *quinquepartitum*, quinquepartite; and *multipartitum*; or numerously parted.

Folium integrum, an entire leaf.

- *truncatum*, a truncate leaf; or a leaf ending in a transverse line, so that it seems as if the tip had been cut off.
- *præmorsum*, a leaf ending very obtusely, with unequal notches.
- *emarginatum*, a leaf notched at the end.
- *obtusum*, an obtuse or blunt leaf.
- *acutum*, an acute leaf, ending in an acute angle.
- *acuminatum*, an acuminate or sharp pointed leaf, ending in a subulate or awl-shaped point.
- *cirrhosum*, a cirrhose leaf, terminating in a tendril.
- *spinosum*, a spiny or thorny leaf.
- *dentatum*, a toothed leaf.
- *serratum*, a serrate leaf, toothed like a saw.
- *crenatum*, a crenate leaf, having the edge cut with angular or circular incisures, but not inclining towards either extremity.
- *repandum*, a repand leaf, having its rim terminated by angles, with sinuses between them.

Folium cartilagineum, a cartilaginous leaf.

- *ciliatum*, a ciliate leaf, having the edge guarded by parallel bristles, longitudinally, similar to the human eyelashes.
- *lacerum*, a lacerated leaf, with the edge variously cut, as if it were torn.
- *erosum*, an erose, or gnawed leaf, as if gnawed by insects.
- *integerrimum*, absolutely entire, the margin or edge not being in the least cut or notched.
- *viscidum*, a viscid leaf, covered with a tenacious juice.
- *tomentosum*, a tomentose leaf, downy or cottony.
- *lanatum*, a woolly leaf, or covered with a substance resembling a spider's web.
- *pilosum*, a hairy leaf, having the surface covered with long and distinct hairs.
- *hispidum*, a hispid leaf, or covered with minute prickles.
- *scabrum*, a rugged leaf, resembling shagreen.
- *aculiatum*, a prickly leaf.
- *striatum*, a striated or streaked leaf.
- *papillosum*, a papillose leaf, having the surface covered with fleshy dots.
- *punctatum*, a dotted leaf.
- *nitidum*, a glittering or glossy leaf.

Folium plicatum, a plaited leaf, or folded like a fan.

— *undulatum*, a waved leaf, or having the surface resembling waves.

— *crispum*, a curled leaf.

— *rugosum*, a wrinkled leaf.

— *concavum*, a concave leaf, with its edges standing above the disk.

— *venosum*, a veined leaf; the vessels of which branch or variously divide over the surface. Where a leaf has no perceptible vessels, it is called—

— *avenium*, a veinless leaf.

— *coloratum*, a coloured leaf, applied to a leaf of any other colour than green.

— *glabrum*, a smooth leaf.

— *teres*, a columnar leaf, a leaf without angles.

— *tubulosum*, a tubulous or hollow leaf, as in the onion; and most singularly in the *Sarracenia purpurea*.

— *Carnosum*, a fleshy leaf, full of pulp within.

— *compressum*, a compressed or flattened leaf.

— *planum*, a plane or flat leaf, having the two surfaces parallel.

— *gibbum*, a gibbous leaf, having both surfaces convex.

Folium convexum, a convex leaf, with the edge more contracted than the disk.

— *depressum*, a depressed leaf, hollowed in the middle, by having the disk more depressed than the sides.

— *canaliculatum*, a channelled leaf, hollowed above with a deep longitudinal groove, and convex underneath.

— *ensiforme*, a sword-shaped leaf, tapering from the base to the point.

— *acinaciforme*, an acinaciform leaf, fleshy, and compressed, and resembling a sabre, faulchion, or scimitar.

— *dolabriforme*, a dolabriform leaf, resembling an axe, or hatchet.

— *linguiforme*, a tongue-shaped leaf, linear and fleshy, blunt at the end, convex underneath, and having usually a cartilaginous border.

— *anceps*, an ancipital leaf, having two prominent longitudinal angles, with a convex disk.

— *triquetrum*, a three-sided leaf.

— *sulcatum*, a furrowed, grooved, or fluted leaf.

— *carinatum*, a carinated leaf, having upon the back a longitudinal prominency, like the keel of a vessel.

— *membranaceum*, a membranaceous leaf, hav-

ing no perceptible pulpy matter between the two surfaces.

COMPOUND LEAVES, are those whose foot-stalks are terminated by several expansions; in other words, whose divisions extend to the common foot-stalk, which, not running into the membranaceous part of the leaf, supports the several lobes, or lesser vessels, called *foliola*, and of which the compound leaf consists.

The *foliolæ*, or leaflets, as Dr. Martyn renders the word, are true simple leaves, the forms of which, like those of the simple leaves already treated off, are very diversified. These leaflets are sometimes furnished with particuliar foot-stalks; sometimes they are destitute of such foot-stalks, but are seated upon the middle rib of the compound leaf. The former leaflet is called *foliolum petiolatum*, a petioled leaflet; the latter *foliolum sessile*, a sessile leaflet.

In these Compound Leaves, the central longitudinal fibre, or part to which the leaflets are attached is, as already observed, called the costa, or rib. This part of the leaf is, by some botanists, called a nerve; but this term ought not to be admitted into botanical language, since there is no reason to believe that any peculiar sensibility, the attribute of nervous matter, resides in the central or any other fibre. It has also been

called a vein; to this term there seems no objection, since it is now well known that a fluid circulates through every part of the leaf along the course of the middle rib, and of the branches which it sends out.

Compound leaves are distinguished by Linnæus into three classes, viz.:

Once compounded; twice compounded; and more than twice compounded.

First.—The *folium compositum*, or leaf only once compounded, admits of the following species or varieties, viz.:

Folium articulatum, a jointed leaf; when one leaflet grows from the top of another.

— *digitatum*, a digitate leaf; when a simple or undivided foot-stalk connects several distinct leaflets at the end of it, as in different species of *Æsculus*, (horse chestnut.)

— *binatum*, a binate leaf, having a simple petiole connecting two leaflets on the top of it.

— *ternatum*, a ternate leaf, having three leaflets on one petiole. as in Trefoil, Strawberry, &c.

— *quinatum*, a quinate leaf, having five leaflets on one petiole.

— *pinnatum*, a pinnate leaf, composed of a

number of leaflets, arranged like wings, along both sides of the middle rib.

Examples of this beautiful leaf are found in the different species of *Robinia*, *Cassia*, *Pea*, *Vetch*, &c. &c. Under the general head of the pinnate leaf, Linnæus refers to various varieties, such as the following:

Folium pinnatum cum impari, unequally pinnate, when the wings composed of leaflets, are terminated by a single leaflet, as in *Robinia viscosa*.

- *cirrhosum*, cirrhosely pinnate; terminated by a tendril.
- *abruptum*, abruptly pinnate, neither terminating by a leaflet nor by a tendril.
- *opposite*, oppositely pinnate; having the leaflets placed opposite to each other, in pairs, as in *Cassia marilandica*.
- *pinnatum alternatim*, alternately pinnate; the leaflet ranged alternately along the common petiole.
- *interrupte*, interruptedly pinnate; having smaller leaflets interposed between the principal ones.
- *articulate*, jointedly pinnate; when the common foot-stalk is articulated or jointed.

Folium decursive, decursively pinnate; when the leaflets run into one another, along the common petiole.

— *conjugatum*, a conjugate leaf, having only one pair of leaflets.

Secondly.—The *Folium compositum decompositum*, or decompound leaf. This is formed when the primary petiole is so divided that each part forms a compound leaf; that is, the foot-stalk, instead of supporting small lobes, or leaflets, on the top, or on each side, bears partial foot-stalks, from which proceed the leaflets on both sides. Of this kind there are the following varieties:

Folium bigeminatum, or bigeminate leaf; having a dichotomous or forked petiole, with several leaflets at the extremity of each division.

— *biternatum*, a biternate or doubly-ternate leaf; when the petiole has three ternate leaflets, as in *Epimedium*.

— *bipinnatum*, a doubly-winged leaf, or frond; when the common petiole has on each side of it pinnate leaves, as in *Athamanta libanotis*, and many ferns.

— *pedatum*, a pedate leaf; when a bifid or forked petiole connects several leaflets on the inside only; as in the *Arum*, &c.

Thirdly and lastly.—The *Folium compositum supra decompositum*, supra decompound leaf, or a leaf which is more than twice compounded. This is a species of compound leaf, in which the petiole, being several times divided, connects many leaflets, each part forming a decompound leaf; as in *Pimpinella glauca*, *Ranunculus rutæfolius*, and others; of this there are the following species, viz.

Folium triternatum, a triternate or triply-threecfold leaf; is when the petiole has three biternate leaves.

— *tripinnatum*, a tripinnate, or three times pinnate-leaf; when the petiole has bipinnate leaves ranged on each side of it; as in the *Peteris aquilina*, and other ferns.

— *tergeminum*, a tergeminate or thrice-doubled leaf, and which arises, as Professor Martyn says—“When a forked petiole is subdivided, having two leaflets at the extremity of each subdivision; and also two other leaflets at the division of the common petiole.”

DETERMINATION.

The *determination* or *disposition* of leaves, whether they be simple or compound, comprehends the following particulars, viz.

The *Locus*, or place of the leaf.

The *Situs*, or situation.

The *Insertio*, or insertion; and

The *Directio*, or direction.

By the term *LOCUS*, or place of the leaf, Linnæus means the particular part where it is attached to the plant; and under this head he enumerates the following varieties, viz.

Folium primo, the seed-leaf, or the primary leaf of the plant, being the cotyledons or lobes of a seed expanded, and in a vegetating state.

— *radicale*, a root-leaf, proceeding immediately from the root, and not adhering to the stem.

— *caulinum*, a cauline leaf; growing immediately on the stem, without the intervention of branches.

— *rameum*, a branch leaf, growing on or proceeding from a branch.

— *axillare*, an axillary leaf; growing at the angle which is formed by the branch with the stem.

— *florale*, a floral leaf; immediately attending the flower, and never appearing but with it. This, however, must not be confounded with the *bractæ* or *bracte*.

The *Situs*, or *situation* of leaves, respects

their position in regard to themselves; and in this subdivision there are the following varieties.

Folia stellato, or stellato leaves; when more than two leaves surround the stem in a whorl, or radiate like the spokes of a wheel; of this there are examples in *Rubia* (Madder) *Asperula odorata* (sweet Woodruff), &c. &c., such leaves are also called *Verticillate*; *terna*, *quaterna*, *quina*, *sena*, &c., or three-fold, four-fold, five-fold, and six-fold leaves; these, of course, are to be understood as different varieties of stellate leaves, when the leaves grow in a whorl, three, four, five, or six together.

- *opposita*, opposite leaves, growing in pairs, each pair decussated, or crossing that above or below it.
- *alterna*, alternate leaves, coming out one after or above another, in a regular succession or gradation, as in *Ludvigia alternifolia*; the term alternate is opposed to the opposite.
- *sparsa*, scattered leaves; neither opposite nor alternate, nor in any regular order; as in several species of the Lily.
- *conferta*, crowded or clustered leaves; leaves so copious as to occupy the whole of the

branches, hardly having any space between, as in the *Antirrhinum linaria*.

Folia imbricata, imbricate leaves; lying over each other like the scales on a fish.

— *fasciculata*, fascicled leaves; growing in bundles or bunches from the same point, as in the Larch-tree.

— *disticha*, two ranked leaves; leaves, respecting only two sides of the branch, though inserted on all parts of it, as in the Fir and others.

INSERTIO.

By the term *Insertio*, or *insertion* of the leaves, is meant the manner in which they are attached to the plant; in this view they are recognised as follows, viz.

Folium peltatum, a peltate or target-shaped leaf; having the foot-stalk inserted into the disk of the leaf, instead of the edge or base, which is the more common mode of insertion; as in different species of *Nelumbium*; the *Tropæolum* (Nasturtium), and others.

— *petiolatum*, a petiolate or petioled leaf; growing on a petiole or foot-stalk, which

is usually inserted into its base, as in the greater number of leaves; (the term is opposed to sessile.)

Folium sessile, a sessile leaf; a leaf which is immediately connected with the stem or branch, without the intervention of a foot-stalk, as in *Rhexia virginica*, and *Veronica chamædrys*.

— *decurrens*, a decurrent leaf; this is a sessile leaf, with its base extending downwards along the trunk, or stem; as in *Symphytum* (Comfrey), *Cordus* (Thistle), and others.

— *amplexicaule*, a stem-elasping leaf, embracing or surrounding the stem by its base: some leaves only go half round the stem; these are denominated,—

— *semiamplexicaelia*, or half-stem-elasping leaves.

— *perfoliatum*, a perfoliate or perforated leaf, having the base of the leaf entirely surrounding the stem transversely, so that the stem appears to have been driven through the middle of the leaf, as in *Bupleurum rotundifolium* (Thoroughwax), *Eupatorium perfoliatum* (Thoroughwort), and others.

— *connatum*, a connate leaf; when two opposite leaves are so united at their bases as to

appear as though they were one leaf; examples of which are seen in the *Garden honey-suckle*, &c.

Folium tubulosum, a tubular leaf; investing the stem or branches by its base, in form of a tube; as in many *grasses*, *Liliaceous* plants, and others.

DIRECTIO.

With respect to their direction, leaves are distinguished as follows:

- *adversum*, an adverse leaf; when the upper side is turned to the south, as in *Amomum*.
- *obliquum*, an oblique leaf, having the base directed towards the sky; and the apex, or point, towards the horizon; as in *Protea* and *Fritillaria*.
- *inflexum*, an inflex or inflected leaf; bent upwards at the end, towards the stem.
- *adpressum*, an appressed leaf; when the disk approaches so near to the stem as to seem as if it were pressed to it with violence.
- *erectum*, an erect or upright leaf; when it makes with the stem an angle so acute as to appear to be close to it.
- *patens*, a spreading leaf, forming an acute angle with the stem or branch upon

which it is placed, between the erect and horizontal position.

- *horizontale*, a horizontal leaf; making a right angle with the stem, the upper disk being turned towards the sky.
- *reclinatum*, a reclined leaf, bent downwards, so that the point of the leaf is lower than the base.
- *revolutum*, a revolute leaf, having the edges rolled back, or towards the lower surface; as in *Rosemary*, *Kalmia glauca*, *Vaccinium oxycoccos*, and *Vitis Idæa*, (Cranberry and Cow Berry.)
- *dependens*, a leaf hanging down, or pointing directly to the ground.
- *radicans*, a rooting leaf, a leaf shooting forth radicles, or roots; as in some aquatic plants: this term is also applied to those leaves which, being planted in the ground, there strike root and vegetate; such are the properties of the succulent leaves of several of the *Liliaceous* plants, the *Aloë*, the *Squill*, the *Orange*, and many others.
- *natans*, a floating leaf; a leaf which lies or floats upon the surface of the water; as in *Nymphæa* (Water lily), *Potamogeton natans*, *Trapa natans*, &c. &c.
- *demersum*, a demersed leaf, called also a drowned or sunk leaf; a leaf which grows

below the surface of the water. Examples of this species are found in *Vallisneria spiralis*, in *Hottonia palustris* (Water violet), *Potamogeton* (Pond weed), and in many other aquatic plants. Some plants are constantly placed below the surface of the water, whilst others, from the coldness of the air, are contracted; they are consequently withdrawn from the surface, and by which they escape the rigours of the winter months; this is particularly the case with the *Callitriche* (Water-starwort), and the *Stratiotes aloides* (Fresh-water soldier, or more properly sailor).

OF THE FULCRA.

The fulcra are agents for the support of those parts of the plant proceeding from the main stem, which are to bear the flowers, or, in the absence of flowers, the leaves, as in the Ivy. The number and character of these fulcra, Linnæus has, in different parts of his writings, treated somewhat inconsistently. This indecision has given rise to much variety of opinion. Professor Lindley argues that the fulcra of Linnæus are in general to be considered as nothing more than curious transformations and elongations of the

petiole, &c. This opinion, however, is not maintainable, though at the same time it is probable that the nomenclature of botany would lose little of its value by the entire rejection of the term *fulcra*.

Under this head, Linnæus enumerates the following:

The *Petiole*, *Peduncle*, *Spina*, *Aculeus*, *Glandula*, *Pilus*, *Cirrus*, *Stipula*, and *Bractæ*.

The first two may be rejected on the authority of Linnæus himself, who having determined them to be (partial) stems, they cannot be regarded as anything else, nor as belonging to any other part of the plant.* It is equally certain that the four which follow them cannot, with any degree of propriety, be considered as props or supports, no circumstances appearing to warrant our investing the *Spina*, *Aculeus*, *Glandula*, and *Pilus*, with such capabilities. These four subdivisions may, therefore, be rejected in this place, and considered under the separate head of *Absorbents* and *Exhalents*. *Cirrus*, *Bractæ*, and *Stipula*, are more properly termed *fulcra*, supporters, or props, and they only have any claim to the appellation.

* See pages 16 and 17, *petiole*.

FULCRA.

The Fulcra, more properly so called, are the

CIRRUS, STIPULA, AND BRACTÆ.

First.—The *Cirrus* (a curl,) is translated a *Tendril*, it 's also called a *clasper*. It is a fine spiral string, or fibre, proceeding from different parts of the plant, by means of which it fastens itself to some other plant or body. Various species of tendrils are mentioned by Linnæus, but they may be all resolved into two divisions, viz., according to their place of origin or situation, and according to their form, or the number of leaves which they support.

First.—According to their place of origin: when the tendril proceeds from the axil, or angle, formed by the branch with the stem, or by the leaf with a branch, it is called *Cirrus axillaris*.

When the tendril proceeds from the leaf, as in the *Pisum ochrus*, or winged pea, it is called *Cirrus foliaris*.

When proceeding from the petiole or foot-stalk of the leaf, it is called *Cirrus petiolaris*.

When proceeding from the peduncle, it is called *Cirrus peduncularis*.

Second.—According to their form: this mode of division affords the following classification.

Cirrus simplex, a simple or undivided tendril.

Cirrus trifidus, a three-cleft tendril, or a tendril divided into three parts.

— *multifidus*, many cleft, or often divided.

— *diphyllus*, a two-leaved tendril, or a tendril supporting two leaves.

— *tetraphyllus*, a tendril supporting four leaves.

— *polyphyllus*, a tendril supporting many leaves.

— *convolutus*, a convoluted tendril, or a tendril twisted into rings or spirals.

— *revolutus*, a revolute tendril, it is so called when a spire of the spiral, having made half a revolution, turns back in a contrary direction; this species of tendril is seen in the *Passiflora*, plate 14, in this work.

Tendrils are very important parts in many plants. The *Bignonia radicans*, called *Trumpet flower*, as well as the *Ivy*, throw out tendrils (erroneously taken for roots,) on each side of the stem, by which it is enabled to climb up any surface tolerably uneven, such as a wall, thatch, or an old tree. In consequence of its being rarely seen on a young tree, on whose smooth bark it finds a difficulty to climb, it has been supposed to attack only sickly ones, and to expedite their decay. One of our poets, otherwise most happy in his descriptions of nature, has unfortunately rendered this opinion all but impossible

to eradicate; but the fact is, that the Ivy derives all its nourishment from its own root, leaves, &c. This will become apparent by observing, that the ivy on a dead wall is as vigorous as that upon a living tree.

In the Cucumber, and cucurbitaceous plants, the tendrils curve alike for sustentation, support, and shade. By their means, the trunks of the plants are bound as it were together, and prevented from being at the mercy of the winds; while, at the same time, an artificial arbour is made by their own leaves under which the tender fruits lie, and are protected from the fiercer rays of the sun.

BRACTÆ.

The *Bracta*, Bracte, or floral leaf, is a leaf which, in the majority of plants, differs from the true leaves both in shape and in colour; it is commonly situated on the peduncle between the true leaves and the calyx, and often so near to the corolla as to be mistaken for the calyx. This approximation is evident in the *Helebore*, *Nigella*, *Bartsia*, *Peganum*, and other plants. The following, among many, furnish us with remarkable instances of the bractæ.

The *Tilia* or *Lime-tree*, *Melampyrum*, *Bartsia coccinea*,* some species of *Fumaria*, the *Monarda*

* See Plate 10.

didyma or *Oswego-tea*, *Polygala* or *Milkwort*, *Ononis* or *Rest-harrow*, *Anthyllis* or *Lady's finger*, *Glycine frutescens*, &c.

In general, the bractæ are of the same duration as the common or true leaves of the plant; this circumstance is worthy of attention, as it will, in some instances, enable us to distinguish the bracta from the perianth or flower-cup, which last almost always withers when the fruit has ripened, if not, indeed, before. By neglecting this intimation, the young and inexperienced botanist may fall into serious mistakes, in ascertaining the genera of certain plants; such as *Hellebore*, *Fennel-flower*, *Passion-flower*, and others, which are furnished with bractes, but are destitute of calyx.

The BRACTE is *virides* or green, as in the *Hypoxis erecta* and *Coloratæ*; or coloured, as in *Bartsia coccinea*.*

In point of duration, it is either

Decidux or *deciduous*.

Caducæ or *caducous*,

Persistentes or *permanent*.

In point of number, *bractes* are either—*Una*, one; *duæ*, two; *plures*, more than two.

* See Plate 10.

The following, among many other plants, have, in general, but one bracte, viz.

Chondrilla juncea, *Aristolochia pistolochia*, and *Erica dabœcia*.

The following plants have two bractes, viz. *Campanula alpina*, *Commelina zanonina*, *Rosa canina*, *Roy. na villosa*, *Ruellia ringens*, *Cineraria sibirica*, and *Hypoxis erecta*.

The *Erica calycina*, and *Atractylis cancellata*, have three bractes.

The *Corymbium scabrum*, has four or five.

The *Cunila pulegioides*, *Stipa spinefex*, *Bartsia coccinea*,* and many others, have several bractes.

In respect to size and height, bractes may be shorter than the calyx, as in *Justicia hyssopifolia*, and *Ruellia ringens*; longer than the calyx, as in *Salvia sclurea*, *Ruellia repens*, and *Stipa spinifex*; larger than the calyx, and placed under it, as in *Royena villosa*; shorter than the flower, as in *Salvia sylvestris*, *Fumaria nobilis*, and *Minuartia campestris*; of equal length with the flower, in *Fumaria bulbosa*, *Hypoxis erecta*, and *Ornithogalum comosum*; longer than the flower, as in *Ribes alpina*, and *Minuartia montana*. The *Cunila pulegioides*, besides a number of smaller bractes, has two that are larger than the flower, placed on each side of the foot-stalk.

* See Plate 10.

In some plants, such as the *Crown-imperial*, *Lavender*, some species of *Sage*, *Bartsia coccinea*,* and a few others; the stem is terminated by a number of very large and conspicuous bractes, which are called Coma (*Bractæ comosæ*), from their resembling a head of human hair.

It might appear presumptuous to reject the authority of *Professor Lindley*, *Jussieu*, and many other eminent botanists, did they not practically follow in their illustrations that arrangement which they theoretically undervalue, and therefore it may safely be submitted, taking into consideration the mechanical support the bractæ render, as well as the succour the efflorescence receives from it, that the office of this organ is of the very highest importance.

So satisfied was the late Dr. Darwin of the truth of this, that he writes thus, "All the different kinds of bractes serve the office of lungs, for the purpose of exposing the vegetable fluid to the influence of the air, and of preparing it for the proper nourishment of the reproducing portions of the plant."

ON THE STIPULA, OR STIPULE.

This is the third and last species of *Fulcra*. It is defined by Linnæus to be a scale, or small

* See Plate 10.

leaf, situated on each side of the base of the petiole and peduncle, or foot-stalks of the leaves and flowers, at their first appearance, and designed for the purpose of sustentation and support.

The presence or absence of stipulæ is a characteristic of the same importance as is the insertion of leaves: generally, stipulæ cannot be absent and present in different varieties of the same *natural* order; there are exceptions, but they are so few as not to invalidate the rule.

Stipulæ are very conspicuous in the *Tamarind*, the *Rose*, the *Cassia*, the *Melianthus* or *Honey-flower*, the *Apricot*, the *Peach*, the *Bird-cherry*, the *Magnolia*, and many species of *Pea-bloom-flowers*, &c.

Perhaps in no plant are they more beautifully conspicuous than in the *Liriodendron* or *Tulip-tree*. In this, and in many other vegetables, stipulæ are conspicuously fulcra or supporters; for they enclose, support, protect, and cherish the young leaves, until they have acquired a larger growth and greater strength. For these offices they are admirably calculated, being either membranaceous, succulent, or spiny.

In the greater number of plants which are furnished with stipulæ, there are two of these scales or leaves attached to the stem, one on

each side; in this case they are called *Stipulæ geminæ*, or stipulæ in pairs.

In the *African Melianthus*, and in the *Ruscus* or *Butcher's broom*, there is only a single stipule, which, in the first-mentioned plant, is placed on the inside, and, in the latter, on the outside of the stalk; such as these are called, by Linnæus, *Solitariæ*, solitary.

In some plants the stipulæ grow upon, or are inserted into the sides; these are termed *Stipulæ laterales*, or *Lateral stipules*.

Stipulæ extrafoliaceæ, or extrafoliaceous stipules, are those which grow on the outside of the leaves, or below them, as in *Betula*, (the Beech,) *Tilia*, (the Lime,) and many of the *Diadelphous*, or *Pea-bloom* flowers. The term *extrafoliaceous*, is used in opposition to *Stipulæ intrafoliaceæ*, or intrafoliaceous stipules; stipules which grow above, or *within* the leaves, as in *Prunus padus*.

Stipulæ oppositifolæ, or oppositifolious stipules, are such as are placed opposite to the leaf.

When a stipule surrounds the stem of a plant it becomes, according to Professor Willdenow, an *Ochrea*; in this case, the anterior and posterior margins are united by cohesion, a property which they possess in common with all modifications of leaves, and of which different instances

may be pointed out, as in Magnoliaceæ, where the back margins only cohere; in certain *Cinchonaceæ*, where the anterior margins of the stipulæ of opposite leaves are united; and in a multitude of other plants.

In point of duration, some stipules fall off before the leaves; these are the *stipulæ caducæ*, or caducous stipules; examples of these are seen in the *common Cherry*, the *Almond*, *Poplar*, *Elm*, *Oak*, *Beech*, *Horn-beam*, *Birch*, *Alder*, *Fig*, *Mulberry*, and many others.

Stipulæ deciduæ, or deciduous stipules are those which fall off with the flower, and which is the characteristic of the majority of stipules, but in the *Rose*, *Raspberry*, *Cinquefoil*, *Tormentil*, *Avens*, *Pea-bloom Flowers*, and some others, the stipule remains till after the fall of the leaves, and in such cases, it is called *Stipulæ persistentes*, or permanent stipules.

The terms sessile, adnate, decurrent, sheathing, subulate, lanceolate, sagittate, lunate, erect, spreading, reflex, serrate, ciliate, toothed, cleft, &c., are applied to stipules as well as to leaves. For the explanation of these various terms, the reader is referred to the nomenclature of leaves at page 27.

Although there is sufficient reason to regard the *Stipulæ* as *Fulcra*, according to the Linnæan

system, it must be admitted that in several plants they appear to have nothing to do in the way of support, but these evidences are, however, partial, and not sufficient to warrant the rejection of the opinion of Linnæus, and the adoption of that of his opponents.

We will now consider the SPINA, ACULUS, PILUS, and GLANDULA; as ABSORBENTS or EXHALENTS.

First.—The SPINA, SPINE, or THORN, is a sharp substance, varying in form, and issuing out of the ligneous or woody part of the plant. These parts have been called *Arma*, (arms,) the defensive weapons of plants, but as their natural enemy has never been satisfactorily pointed out, the term seems misapplied.

Instances of the *Thorn* are seen in the *Prunus spinosa*, (sloe or black Thorn,) *cratægus oxyacantha*, (Hawthorn,) &c.

To acquire a knowledge of their various situations, attention should be directed to the *Buck Thorn*, and *Orange Tree*, where the thorns issue from the stem and branches.

Robinia Pseudacacia, where they issue from the petioles.

Agave Americana, (American aloc.) *Yucca filamentosa*, (Adam's needle.) *Ilex aquifolium*,

(Holly.) *Hippomane mancinella*, (Manchineel.)
Ruscus, (Butcher's Broom,) &c.

In each of which they issue from the leaves.

In several species of night-shade, they proceed from the ribs of the leaves.

In the Thistle, from the calyx.

In the *Datura Stramonium*, (Thorn-apple,) and many others, from the pericarp, or seed vessel.

The nomenclature of thorns originates from, and is to be referred to their situation, for example:

Spina terminalis, is a thorn situated at the apex or edges of a leaf, or forming the end of a branch.

It will here be necessary to bring before the reader some facts to illustrate the difference between the *Thorn* and the *Aculeus* or *Prickle*. The Spines of a leaf are formed either by an elongation of the woody tissue of the veins, or by a contraction of the parenchyma of the leaf: in the former case they project beyond the surface or margin, as in the Holly; in the latter they are veins themselves becoming indurated, as in the palmated spines of the *Berberis vulgaris*. The spiny petiole of many Leguminous plants is of this nature, and so strong is the tendency in some plants to assume a spiny state, that in a specimen of *Prosopis* from *Chili*, which was in

the possession of Professor LINDLEY, half the leaflets of its bipinnated leaves had the upper part converted into spines: but the most striking difference between the *Spine* or *Thorn*, and the *Aculous* or *Prickle*, is seen in the point issuing from the end of a branch; and this is generally produced by the branch being imperfectly formed, whereby it loses its power of extension and elongation, becoming unusually hard, and acquiring a sharp termination. Another characteristic of the *Spina* is, that it occasionally bears leaves, an instance of which is seen in the White-thorn.

Of these organs it is unnecessary to enter very minutely into the nomenclature, since it has been already stated that it is derived from their situation; but it will be proper to explain that the *Spina axillaris* is a *Spine* or *Thorn*, issuing out of an angle formed by a branch or leaf with a stem.

Thorns are considered as simple, double, triple, &c.

Simple, as in the majority of *Thorny* plants;

Double, as in the *Horned Acacia*; and

Triple, as in the *Gleditsia triaeanthos*, (Honey-locust.) It must not, however, be taken as a general rule, that the number of thorns growing together in the same species, is always the same; for in the *Gleditsia*, although the number is usually three, there is sometimes only one, sometimes two, and sometimes five or six.

The *Aculeus*, (from *Aeus*, a needle,) or prickle, is, like the thorn, a sharp substance, but proceeds from the bark only, and not from the wood: in this respect it differs essentially from the *Spina* or *Thorn*, which is a prolongation of the woody part of the vegetable to which it belongs. The difference of origin is apparent from the facility with which the *Prickle* is detached, the bark only coming away with it; whereas the *Spina* or *Thorn* is not removed without, at the same time, removing a portion of the wood. In point of general features, the *prickles* (*aculei*) are less rigid than the thorns, but they are equally opaque; they are conical and formed of masses of cellular tissue, terminating in an acute point, and it is believed that they invariably point downwards; they are found on all parts of a plant, except the stipulæ and stamens, though very rarely on the corolla, as in *Solanum Hystrix*. The most usual situation of the prickle is upon the stem, as in the *Rose*, the *Raspberry*, the *Berberry*, the *Aralia spinosa*, (Angelica-tree), the *Gooseberry*, and other bushes, &c.

HOOKE, in describing the *prickles* of the *stinging nettle*, says, "They are tubular, and arise from bulbs, containing an acrid fluid, which, upon the prickle being pressed down, is forced up and discharged through minute pores at the tips of

each, in a similar way to the poison discharged through the sting of wasps."

In form and appearance, *Prickles* are *erecti*, straight, as in the *Solanum indicum*.

Incurvi, bent downwards, as in *Mimosa cineraria*.

Recurvi, recurved, or bent outwards.

Tomentosi, downy, or covered with a silver white woolly appearance, as in *Solanum sanctum*.

Acerosi, chaffy, as in *Solanum tomentosum*.

Geninati, double, or two growing together, as in *Euphorbia canariensis*, and *Euphorbia officinarum*.

PRICKLES, when divided, are called *furcæ*, or forked; and are termed bifid, trifid, &c., from the number of their divisions.

The *Pilus* or *Hair of Plants*, has next to be considered. This term comprehends every kind of substance of a villous character, which covers the vegetable, however partially.

According to Professors Du Hamel and De Candolle, this substance, (like the Human Hair,) arises from small bulbs, either within the rind, or in the first layer of the inner bark; they are not found on roots, except at the time of germina-

tion, or on parts that grow under water. In some cases, they are like simple threads, in others like cells, stretched out lengthwise, threaded on each other, having frequently, instead of a sharp point at the tip, a minute vesicle, which gives out an oily fluid, somewhat glutinous, and sometimes coloured. Examples of this may be found in the *Moss-rose*, the *Sun-dew*, and others.

This substance originates either directly from the cuticle, or from the cellular substance beneath it, and never has any communication with the vascular or ligneous system; it varies extremely in length, density, rigidity, and other particulars. The following species are enumerated by Linnæus and others.

Pili, hairs, long, soft, and erect.

Lana, wool, closely curled.

Tomentum, interwoven, or entangled, closely pressed to the stem, and scarcely perceivable.

Strigæ, stiffish, flat hairs.

Setæ, bristles, or stiff and roundish hairs.

Hami, hooks, sharp points curved back.

Glochides, barbs, forked at the apex, and both divisions of the fork hooked.

Villus villosus, very long, very soft, erect, and straight.

Velumen, *velvet*, short, very dense and soft, yet rigid, forming a surface like velvet.

Ciliæ-ciliatus, long, and forming a fringe to a margin, like an eye-lash.

Stings, stiff and pungent, giving out an acrid juice, if touched, as in the nettle.

Pili Capitali, glandular hairs, tipped with a glandular exudation, as in *Primula sinensis*.

Sericeus, *silky*, long, very fine, and pressed closely to the surface, so as to present a subluceid and silky appearance.

Arachnoid, very long, and loosely entangled, so as to resemble a cobweb.

Barbatus, *bearded*, the hairs long, and placed in tufts.

Asper, *rough*, the surface clothed with hairs, the lower joint of which resembles a little bulb, and the upper a short, rigid bristle.

To this catalogue it may be added, that the hairs which are distributed over the surface of vegetables, assume a considerable variety of forms. Thus, in the *Leguminous* plants, they are generally cylindrical; in the *Malvaceous* plants, they terminate in a point; in the *Agri-monia*, they are shaped like a fish hook; in the *Nettle*, they are subulate or awl-shaped, and jointed; and in some of the *Syngenesious* plants, that are furnished with hollow or funnel-shaped florets, they terminate in two obtuse joints.

The limits of an elementary work, render it impossible to enter upon more than a brief in-

vestigation of the history and appearances of all these varieties of capillaceous substances. The subject, however, is too important in the study of plants to be dismissed without some further notice.

It is not to be concluded that any plants are destitute of some substance resembling hair, because, to the naked eye, the leaves, or other parts of them appear to be absolutely smooth. The microscope discovers, in all cases, numerous minute hairs, and that, too, generally of an uniform character and disposition; and it is upon the young stems of plants, that this delicate covering is more especially discoverable. From this uniformity of character, and more particularly of disposition, the learned and judicious GUETTARD has observed, that they constitute good generic, but not specific characters.

Had Linnæus lived a few years longer, he would doubtless have ceased to regard any one of the three divisions last under our consideration as Fulcra; they are all essentially exhaling and absorbent lymphatic vessels. The Pilus may, however, under particular and local circumstances, afford protection,—*First*, in saving that part of the plant on which they are seated, from friction:—*Secondly*, in protecting it from cold, when growing in the Alpine or other cold districts;

and *Thirdly*,—in preventing a too rapid evaporation in such plants growing in hot climates.

In discussing this much disputed subject, the writer commenced by presuming to differ from the great Linnæus; a course adopted with much hesitation, and adhered to only from a firm conviction that in this instance, many eminent men have fallen into error, from their not having taken notice of the indecision which Linnæus displayed in his various writings. Reasons have been given to support the opinion advanced, and it may now be asked, whether the *Spina*, the *Aculus*, or the *Pilus*, can, by possibility, be regarded as Fulera, in the mechanical sense meant by Linnæus, when he wrote of the bractes Cirrus and Stipulæ. It is clear that the Glandula is totally out of the question. That the *Spina*, &c., cannot be fulcra or supports, is evident from their positions; and that the *Pilus* is composed of absorbing and exhaling vessels is certain. That the *Aculus* is of the same nature is probable, but of this we have not the same proof as we have of the *Spina*. There are instances of the latter bearing leaves, as in the White-thorn. This circumstance shews it to be both an absorbent and an exhalent organ. If the advocates of the terms adopted by Linnæus, as applicable to the organs now under our consideration,

should still be unconvinced, they may be asked in conclusion, how it is that in the *Apple* and *Pear*, in their wild varieties, being spiny, and producing unprofitably, should, under domestic management, not only produce profitably, but, at the same period, cease to produce the spines; when by the increase of their fruit, both as to size, quality, and quantity, it is but natural to conclude they would require increased means of support. Nature always proportions means to ends, and in this case we may find additional reasons for concluding that these parts of the plants were never intended for supports.

Pruning is of the most salutary processes of the modern domestic system, and its operation may be explained, in reference to the opinions which have been advanced. By its application the absorbing and secretory powers are brought more immediately into the neighbourhood of the fructifying or s. to the great increase of the powers of the plant, as is apparent from the vast augmentation of produce consequent upon the practice.

OF THE GLANDULA, GLANDULE, OR GLAND.

This is the last organ of vegetation which Linnæus has thought entitled to be considered as one of the Fulera. That it has no pretensions to the name has been already mentioned, and it is to be lamented that Linnæus should have so

termed it, in his *Delineatio Plantæ*, when we find he abandoned this opinion at another period, as appears in his *Philosophia Botanica*. In that work, his definition of a Gland conveys the notion of a *papilla*, whose office it is to exhale some substance in a gaseous form, or to relieve the plant of some redundant fluid or humour. This is more rational, for there appears to be a serious objection both to the former term and its definition. There is, most assuredly, little resemblance between the properties and functions of this organ and the animal glands to which the name would lead us to suppose it bore an affinity; but sanctioned as the term has been, it is believed, by every botanist of eminence, it would be extremely difficult to procure its abolition, although a name much more appropriate might readily be found.

The characteristics of this organ as exhibited in different plants, will now be explained.

According to Professor Link, Glands are simple or compound elevations in the stratum of the parenchyma, lying immediately below the cuticle. They are simple when consisting of one single cell, or when placed upon a hair, acting as a conduit or reservoir, and occasionally interrupted by divisions. In this situation, compound organs are never found. They are compound, in the general sense, when consisting of various cells, and seated upon the stalk, containing several

conduits, formed by rows of cellular tissue. They are common, in the Rose and the Bramble; in which they become very rigid, and from this cause they have frequently been taken for *Aculi*. In some species they abound on the calyx and corolla, not giving out any exudation; they contain, however, a deep red juice within their cells, but which is only discoverable by the microscope. In some they are much branched, in others they form curious humid appendages at the apex of the stamens. But the most common exhibit to the unassisted eye a form resembling a blister, as is seen in St. John's-wort. In the following plants the Glandulus is visible without the aid of the microscope.

In many *Ferns*, they are like a number of small scales.

In many *Fir-trees*, they are not unlike the Millet seed.

In the *Apricot-tree*, they resemble a small cup.

That they perform an important function is inferred from their being found to be frequently furnished with a proper footstalk; although, when situated upon the leaves of plants, they are without a footstalk. In the following plants they are placed on the petioles or footstalks of the leaves, viz.

Ricinus communis, *Cassava*, *Passion-flower*; many species of *Cassia* and *Robinia*.

In the *Willow-tree* they are situated on the indented edges of the leaves.

In the *Almond-tree*, *Gourd*, *Gelder-rose*, and *Bird-cherry*, they proceed from the base of the leaf.

In the *Urena*, *Tamarisk*, *Ricinus*, and others, they spring from the back of the leaf; whilst in the *Butter-wort* and *Sun-dew*, they are seated on its upper surface.

In some plants, as in *Bauhinia aculeata*, (*Mountain ebony*,) and the *Apricot-tree*, the Glands are situated upon the tender stipules or scales, which surround the young footstalks of the flower and the leaves; such as these are, by *Linnaeus*, called *Glandulae stipulares*, or stipular Glands.

To the general head of Glands, *Linnaeus* seems also to refer the following, viz.

Folliculi, follicles; vessels distended with air, such as are observable at the roots of the *Utricularia*, or *Water-milfoil*; and on the leaves of the *Aldrovanda* vesiculosa*.

Utriculi, utricles; vessels, said to be filled with a secreted liquor; the notion of this secretory power, however, is not tenable, a point upon which the majority of botanists now agree.

* Two natives of the marshes of India and of Italy.

It is adverted to here, only for the purpose of noticing the most remarkable examples of what Linnæus calls the *Utriculus*; the *Nepenthes destillatoria*, a native of *Ceylon*, furnishes us with the first example;—the extremity of the leaf of this plant terminates in a filiform process; and this, again, in a cylinder, which is closed at the end by an opercle, or lid, so as to be able to retain water. The second are afforded by *different species of the genus SARRACENIA*; these have hollow leaves, which can retain, for a considerable time, the water which has been received by them from the rains or dew.

The structure of these plants is quite sufficient to overthrow the opinion of Linnæus, on this point, who evidently mistook a casual capability for an universal organ of sustentation.

Whatever may be the general uses of these organs, or the opinions of botanists on the subject, they are obviously of great importance in discriminating the species of certain genera of plants; for instance, the *Almond* and the *Peach* are two distinct species of one genus, the *Amygdalus*; but it is hardly possible to distinguish the two species without calling in the aid of what we are obliged to call the Glands; in the *Almond*, these are situated at the base of the leaves, upon the serratures; the *Peach* is destitute of the glandular structure.

OF THE HYBERNACULUM, OR WINTER
QUARTERS OF THE PLANT.

This is the last part of the plant which can be considered as an organ of vegetation, and which Professor Martyn calls the *Hybernacle*.

The Hybernaculum is defined, by Linnæus, to be a part of a plant which encloses the embryo herb, protecting it from external injuries of all kinds, and, in his language, it is either a *bulbus*, or a *gemma*.

Of the bulbi or bulbs, mention has been already made,* and the propriety of considering them as roots, in the strict sense of the word, has been questioned, although their approximating to the nature of roots is not denied. It will be unnecessary here to resume the argument, and we may, therefore, proceed at once to the consideration of the *Gemma*, or bud. Previously, however, to doing this, it will be proper to give some account of the *Bulbus Caulinus*, and other similar productions.

The *Bulbus Caulinus*, or *stem bulb*, is a small species of bulb, or hybernacle, which is situated immediately upon the stem or stalk of some plants, and having no immediate connexion

with the root. In the *Dentaria bulbifera*, (Tooth-wort,) and *Saxifraga cernua*, as well as the *Lilium bulbiferum*, or bulbiferous lily, we find small bulbs in the wings of the leaves, that is, at the place where the leaf is united to the stem. If, after the stalks have decayed, these bulbs be taken off and planted, they will soon take root and vegetate; it is evident, therefore, that these productions are the repositories of an embryo plant, and consequently they may, with strict propriety, be considered as a species of hybernacle.

In some alliaceous plants, such as those of the onion kind, bulbs, very similar to those which have just been mentioned, are produced at the origin of the umbel of the flowers, between the peduncles or foot-stalks. Such alliaceous plants are frequently called bulbiferous plants. The individual bulbs are well known by gardeners, and, in common language, by the name of cloves: thus, the structure of these cauline and umbel-bulbs, appears to be very similar to that of the true root-bulbs, of which an account has already been given.

Bulbous granules, or productions, are very common in many species of *Lichen*, belonging to the 24th Class; but in these *Lichens*, the bulbs are situated without the axils of the leaves.

In many plants we observe appearances, which, from their general affinity to that of the true bulbous granules, deserve to be mentioned in this place.

The *Polygonum viviparum*, (Alpine bistort,) of the Scotch and Cumberland mountains, some species of Poa and other grasses, shoot out, from their flowers, bulbouslike processes, which, falling to the ground, there take root and vegetate into plants, similar to the parent: such plants are called viviparous. In the Tangekolli, a plant of Senegal, which is particularly mentioned by Mr. Adanson, the seeds are said to germinate in the fruit, or capsule; forming bulbs, even before the fruit has arrived at maturity. The Agave Vivipara, of East Florida, exhibits a very similar appearance; after the flowers of this fine vegetable have fallen off, the seeds often vegetate, and even arrive to a pretty considerable size, their leaves being sometimes three or four inches long, whilst yet attached to the parent tree. The branches of the Agave frequently appear covered with the young plants; which, falling to the ground, there take root, grow, and flower. To this vegetable, the celebrated Professor Paul Hermann, gave the very appropriate name of *Sobolifera*.

Under this head of *Stem bulbs*, we may with propriety class the succulent leaves of various species of plants, particularly those of the lila-

ceous order, such as the *Aloe*, the *Squill*, and also those of some species of *Arum*, or Cuckoo-pint. These, if they are carefully planted, will, in due time, throw out radicles, or fibres, and vegetate. Hence, it is evident, that there would be some propriety in denominating such leaves hybernacles.

The bulbous granules, whether they be situated in the wings of the leaves, or on parts of the stalk, furnish the Botanist with excellent marks for the discrimination of different species of plants; in the genera *Ornithogalum*, *Dentaria*, *Polygonum*, *Saxifraga*, *Lilium*, *Allium*, &c. &c., it is particularly the case, and the different species of these genera receive their specific names, *bulbifera*, *bulbiferum*, *vivipara*, *viviparum*, &c. &c., from the bulbs which are found upon them.

THE GEMMA, OR BUD.

The Hybernacle, in the strictest sense, and that which most particularly claims attention, is the Gemma, or Bud: this is defined by Linnæus to be an organ seated upon the ascending Caudex (stem,) and branches, and composed of stipules, petioles, the rudiments of leaves, or the cortical scales. In fact, every bud is to be considered as an epitome, or compendium of one or more plants, similar to the parent plant, or in the

words of Lofing, it is nothing else than the plant or vegetable straitened, from a defect in the powers of vegetation; but the term hybernaculum, as given by Linnæus, to designate the bud, is most happily conceived and applied.

Mr. Ray is said to have been the first person who gave to the bud now spoken of, the name of Gemma.

Before the time of that illustrious Professor, of whom England has reason to be proud, the bud, we are told, had been denominated german; it is admitted, indeed, that the term gemma was used before Ray's time, to signify a particuar species of bud; namely, that which contains a flower; and some of the ancient authors, (Pliny in particular,) appear to have carefully distinguished it from the germin, or bud, which contained leaves and wood.

Experience shews that buds assume different forms in different vegetables. In general, they may be said to be small and rounded, or conical bodies, and sometimes ending in a point. But the form of the bud is often so different in the different species of the same genus, as to afford to the botanist a good mark of distinction in the winter season, when the leaves and other parts, upon which the specific characters are more generally founded, cannot be seen; thus, in many species of Willow, and in Rhamnus, or Buekthorn,

the specific characters are often taken from the form of the buds.

In general, buds are placed at the extremity of the young and tender vegetable shoots, and along the course of the branches; they are fixed by a short footstalk, upon a species of brackets, which are the remainder of the leaves, in the axils of which the buds of the present were formed in the preceding year. Sometimes, we observe only one bud in a place; sometimes two, and these are either opposite or alternate; whilst, sometimes they are collected in greater numbers, and in whorls, or rings.

The construction of buds is at once beautiful and intricate. On the exterior surface of these vegetable cradles, we observe a number of scales, which are more or less hard, hollowed like a spoon, and laid over each other in the manner of scales on a fish; these scales are often surrounded with a kind of hair, and are fixed into the inner plates of the bark of the stems and branches, from which they seem to proceed. No one can be at a loss to determine the use of these bud-scales, they serve to defend from cold, and other causes of injury, the tender and delicate embryo plants contained within the bud; the scales are connected with each other, and with the embryo within, by means of a thick, clammy juice, which, in the buds of many vegetables,

such as the *Populus balsumifera*, or Tacamahaca-tree, is of a resinous nature, and highly odoriferous. It is considered probable that, in some plants, this viscous matter may operate in preventing an excess of perspiration from the bud; and it generally follows, that, when the internal parts of the bud have expanded and unfolded, the scales, being no longer useful, fall off.

The following observations of Ledermuller, an ingenious German naturalist, are well calculated to show the delicate and careful structure of the bud. In the winter season, he separated from a *Horse-chesnut* (*Æsculus hippocastanum*), a bud not exceeding in size a common pea; he found the bud to be covered externally with seventeen scales, anointed with a viscid fluid. Having carefully separated these scales, the whole bud, covered completely with down, was brought into view; on removing the down, Ledermuller found the bud surrounded with four branch leaves, and covering a spike of flowers; in this spike he very distinctly counted sixty-eight flowers; and, by the aid of a powerful microscope, even the pollen of the stamens was observable; some of it was opaque, and some transparent.

The different species of buds enumerated by Ledermuller, are three, viz.

1. *Gemma floralis*, a bud containing a flower.
2. *Ditto, foliaris*, a leaf-bud, or a bud containing a leaf or leaves; by *Du Petit Thouars* this has been called a *fixed embryo*.
3. *Ditto communis*, a bud containing both flowers and leaves.

These three different species have received different terms from other botanists, viz.

The 1st has been called *Gemma florifera*.

-- 2d. *Gemma foliifera*.

— 3d. *Gemma foliifera-florifera*.

The superior simplicity of the terms employed by Linnæus may well justify their adoption, especially in an elementary work.

The *Gemma flo:alis*, or *flower-bud*, is that which contains the rudiments of one or many flowers, without leaves, and surrounded with scales. To this species of bud, the French have given the name of "*Bouton à fleur; ou, au fruit*." It is often found at the extremity of the small branches of certain trees, which branches are shorter, more rough, and less furnished with leaves than the rest. It is also observable that this flower-bud is, in general, thicker, shorter, more square, or less pointed than either of the other kind of buds; it commonly terminates obtusely.

The *Gemma foliaris*, is the bud containing the rudiments of several leaves without flowers; this kind of bud is commonly more pointed than the *Gemma floralis*; in some vegetables, however, as in the Hazel, it is nearly round; and in the *Æsculus hippocastanum*, or Horse-chesnut, it is very thick.

The *Gemma communis*; is a species of bud, producing both flowers and leaves, and it is the most common; in general, it is smaller than either of the two preceding kinds; and a remarkable fact is, that the flowers, which are mixed with the leaves, are not always of the same kind. Sometimes the bud protrudes male-flowers with leaves, as in the Pine and Fir-tree. Sometimes it throws out female flowers with leaves, as in the Hazel and Carpinus, or Horn-beam; at other times, androgynos flowers, with leaves, are its offspring, examples of which are seen in the Elm, Cornus, or Cornel-tree, Daphne or Mezercon, and the Almond-tree.

Those buds which are evolved into leaves only, are termed unproductive buds; those which contain both leaves and flowers, are denominated fertile. These terms are very properly applied, and it is to be observed, that the size or bulk of the bud, before its expansion, foretells whether it contains leaves only, or flowers and leaves together.

The use of buds is sufficiently obvious; they are the protecting domes,—the cradles, of the tender embryos, which, in due time, burst from their enclosures, and expose themselves to the eye. Professor Lindley has very justly said, “The leaf-bud perpetuates the individual, the embryo continues the species.”

This view of the subject, the soundness of which may be tested by every individual, is utterly at variance with the theories of certain writers of the present day, who have represented the scales of buds as abortive or imperfect leaves. Such persons forget that in creation there is nothing organically imperfect, that all is harmony and beauty; nothing is redundant, though we may be unable to explain its use.

From what has been advanced, the reader will not be surprised to learn that the greater number of the trees and shrubs of cold climates are bountifully supplied with buds, while they are seldom found upon the vegetables of climates where an intensely cold winter is unknown.

Professor Lofling furnishes the following list of plants, which, in their native soils, are destitute of buds. It will of course be understood, that they constitute only part of a larger number.

The Citron, Orange, Lemon, Cassava, Mock-orange, Blad-apple, Shrubby Swallow-wort,

the Shrubby Geraniums, viz: *Geranium fulgidum*, *G. inquinans*, *G. papilionaceum*, *G. betulinum*, *G. scabrum*, *G. cucullatum*, *G. gibbosum*, *G. carnosum*, *G. peltatum*, *G. acetosum*, *G. zonale*, and *G. vitifolium*; the Berry-bearing Alder, Christ's Thorn, Syrian Mallow, *Adansonia* or Baobab, *Justicia*, Wild Senna, the Acacias, and Mimosas, Coral Tree, Trefoil, Oleander, Tamarisk, Heath, Barbadoes Cherry, Tree Mallow, the Shrubby Nightshades, viz.: *Solanum verbascifolium*, *S. guineense*, *S. pseudocapsicum*, *S. diphyllum*, *S. bonariense*, *S. pimpinellifolium*, *S. sanctum*, *S. tomentosum*, and the *Solanum bahamense*; the Guinea Henweed, Cypress, *Lignum Vitæ*, and Savine. Some of the Vegetables in this list are large trees, such as the *Adansonia*, and several of the *Mimosæ*; whilst others are smaller, but furnished with ligneous or woody stems, and belong to the family of shrubs and under-shrubs.

True or complete buds are never produced upon the annual plants, that is, upon those the roots and stems of which perish after the term of a year; such plants are perpetuated by their seed; from which circumstance, GLEDITSCH has compared the annual plants with insects; the one, like the other, having undergone various changes, arrives at maturity, performs its offices, and then dies.

Mr. RAY, and SIGNOR PONTEDERA, an Italian Botanist of great research, have, at their several periods, instituted a division of vegetables into herbaceous plants and trees, founding the distinction upon the absence or presence of the gemmæ or buds; this division, however, is certainly erroneous, and is calculated to introduce much confusion. It might not be improper, indeed, to adopt such a distinction in the history of the plants of one country not very extensive, and not exhibiting any marked difference of climates; but it is out of place when applied to the plants of the whole world, since, as has been already shewn, the absence or presence of buds, or the scaly appearance essentially appertaining to them, is governed by the climate in which the plant grows.

With respect to the origin of buds, the most probable seems to be that they are derived from the medulla or pith of the vegetable; it is certain that the pith is essentially necessary to their existence and growth; but, as this subject would necessarily lead to a discussion on the anatomical structure of vegetables, it is not within the pale of our present enquiries, nor is its introduction necessary in a work of this nature.

PART II.

THE ORGANS OF FRUCTIFICATION.

*The Fructificatio,** or *Fructification*, consists of the flower and the fruit; neither of which is permanent, but both disappear upon the ripening of the seeds. These are beautifully defined by Linnæus, to be temporary parts of vegetables, terminating the existence of the old, and forming the æra of the new. The flower is the first to decay, or fall off; after which, the fruit advances to perfection; but it is sufficiently established, on the authority of most learned men, that the *primordia*, or earliest rudiments of the fruit, pre-exist in the flower.

The parts of Fructification are seven; the *Calyx*, the *Corolla*, the *Stamens*, the *Pistil* or *Pistillum*, the *Americarp*, the *Seeds*, and the *Receptacle* or *Receptaculum*. Of these, the four first belong to the flower, the two next to the fruit, and the last is common to both.

Every individual flower does not possess all of these; for in some, the *Calyx* is not found; in

* From *fructus*, fruit, and *facio*, to make.

some the Corolla; and, in others, other presumed deficiencies occur.

The *Calyx*, is that exterior part of a flower which encloses the Corolla previously to its expansion, and afterwards embraces and supports it.

The *Corolla*, consists of a leaf or leaves, termed petals, situated within the Calyx.

The *Stamens* are thread-like substances, enlarged at their summits, erect within the corolla.

The *Pistil* is a column crowned with its capital in the very centre of the flower.

The *Pericarp* is the vessel out of which the Pistil proceeds, and in which the seeds are nurtured and contained.

The *Seeds*, for the protecting and perfecting of which the whole process of fructification is designed, are the rudiments of new plants.

The *Receptacle* is the base upon which all the other parts of fructification rest; each of which assumes in different plants very different appearances, and which necessarily require special remark.

First,—The CALYX:* this is defined by Linnæus to be the “Outer bark of the plant, present in the fructification.” Many English

* From *καλυξ*, and originally from *καλυπτω*, to cover; and not from *καλιξ*, a cup, as some have supposed. .

botanical writers have denominated this part, the empalement, and flower-cup. These terms are decidedly erroneous; the word flower-cup, if used, ought certainly to be restricted to one particular species of Calyx, namely, the *perianthium* or *perianth*; whereas the term *Calyx* is a generic term, comprehending various parts, very distinct in their appearances, and, perhaps, in their offices. Linnæus directs our attention to seven principal varieties of calyx, viz.: the *Perianthium*, the *Involucrum*, the *Amœutum*, the *Spatha*, the *Gluma*, the *Calyptra*, and the *Volva*.

The *Perianthium** or *Perianth*, is the most common species of calyx, conveying more than any other the idea of a eup; this is most conspicuous in the *Primrose*, (*primula veris*,) and *Nicotiana*. (tobacco,) in each of which it is placed immediately under the flower.

There are three species of *Perianthium*, as enumerated by Linnæus, viz.:

The *Perianthium fructificationis*,

—— *floris*, and

—— *fructus* :

These are again subdivided according to circumstances.

The *Perianthium fructificationis*, or perianth

* From περι, peri, around; and ανθος, anthos, a flower.

of the fructification, includes both the stamens and the germe; that is, it contains each and all of the organs required for perpetuating the plant. This, as has been before stated, is the most common kind of perianth.

The *Perianthium floris*, or perianth of the flower, contains the stamens, but not the germe. This kind of perianth is exemplified in the Gaura, the Willow-herb, (*Epilobium*,) the Rose, the Apple, and many others; in fact, in all vegetables which have the germe, or seed bud, placed below the receptacle of the flower; illustrations of this peculiar character are shown in Figures 1 and 2, Plate 7.

The *Perianthium fructus*, or perianth of the fruit, contains the germe, but not the stamens. This is exemplified in Figure 2, of Plate 16.

Some vegetables have two perianths, in which case they exhibit both the *Perianthium floris*, and the *Perianthium fructus*; one perianth being appropriated to the flower, and the other to the fruit: illustrations of this fact are seen in the *Linnaea*, Clove-tree, *Morina*, and several others.

From the number of leaves of which the *Perianthium* is composed, it has received the following names:

Perianthium monophyllum, a one-leaved perianth,

as in Tobacco, Thorn-apple, and Primrose.

Perianthium diphyllum, two-leafed, as in the Poppy, Claytonia, and Fumatory.

— *triphyllum*, tri-leafed, as in the Dock, Magnolia, Tulip-tree, Annona or Papaw, Podophyllum pellatum, or May-apple, and the Alisma (Water-plantain).

— *tetraphyllum*, four-leafed, as in the Water-lily, the Heath, and Chierianthus (Wall-flower).

— *petaphyllum*, five-leafed, as in Ranunculus, Becc., Flax, and many plants having more than one petal.

— *hexaphyllum*, six-leafed, as in Lion's leaf, Berberry, and Hillia parasitica.

— *heptaphyllum*, seven-leafed, as in Trientalis, or Winter-green.

— *octophyllum*, eight-leafed, as in Mimulus and Diapensia.

— *decaphyllum*, ten-leafed, as in Galax.

— *polyphyllum*, many leafed.

A *monophyllum*, or single-leafed perianth, is either

Integrum, that is, entire, or undivided, as in Genipa, Olax, and Statice Armeria (Trift).

Bifidum, cleft, or in two segments, as in Tuberos Moschatel, Purslane, &c.

Trifidum, three-cleft, as in *Hermannia* and *Cliffortia*.

Tetrafidum, four-cleft, as in *Galium* and Elephant's head.

Quinquefidum, five-cleft, as in Tobacco, and the major quantity of flowers that are furnished with a calyx of one leaf.

Sexfidum, six-cleft, as in *Ginora Americana*.

Octofidum, eight-cleft, as in *Tormentil*.

Decemfidum, ten-cleft, &c., as in Cinque-foil and Herb-bennet.

Duodecemfidum, twelve-cleft, as in Purple Loosestrife and Water Purslane.

In respect to figure, the Perianth is either *Tubulosum*, tubular, or in the form of a tube.

Patens, spreading.

Reflexum, reflex, or bent back; as in *Asclepias*, *Leontodon*, and *Ranunculus bulbosus*.

Inflatum, inflated, hollow, or puffed up; as in *Physalis* (Ground Cherry), and Yellow-rattle (*Rhinanthus*).

Globosum, globose, or globular, as in *Centaurea* (Knapweed).

Clavatum, club-shaped, as in *Silene*.

Erectum, erect, or upright, as in *Saponaria* (Soap-wort).

Expanded, as in *Ranunculus acris*, one of the plants commonly called *Buttercups*.

In regard to the Proportion it bears to the Corolla, the Perianth is,

Abbreviatum, abbreviated, or shorter than the tube of the Corolla; as in the *Tobacco** and the majority of plants.

Longum, long; or longer than the tube of the Corolla.

Mediocre, or about the length of the tube of the Corolla.

At its apex, the Perianth is either

Obtusum, obtuse or blunt.

Acutum, acute or sharp.

Spinosum, spinous or thorny.

Aculeatum, prickly.

Acuminatum, acuminate or sharp-pointed; similar to a subulate or awl-shaped point.

With respect to its margin, the Perianth is

Integerrimum, entire.

Serratum, serrated, toothed like a saw; and

Ciliatum, having the edges guarded by parallel bristles longitudinally.

The Perianth has also received a variety of

* See Frontispiece.

names according to its surface; but these names having been amply explained in treating of the nomenclature of leaves,* there is no occasion to repeat them here.

The situation of the Perianth, with respect to the Germin, is

Superum, superior; when the Germe is under the lower part of the Perianth, and

Inferum, inferior; when the Germe is above the base of the Perianth.

As it regards its duration, the Perianth is either

Caducum, caducous; or falling off before the complete opening of the flower; as in the Poppy, the *Podophyllum peltatum* (May-apple), and the *Hydrastis Canadensis* (Yellow-root.)

Deciduum, deciduous; or falling off with the flower; that is, with the petals, the stamen, and style; as in Berberry and the Cruciform flowers.

Persistens, permanent; or continuing until the fruit has attained maturity; as in Betony and many others.

In respect to its composition, the Calyx sometimes consists of a number of leaves, which are laid over each other, like the scales on a fish; this is, the *Perianthium imbricatum*, or imbricate

* Page 27, et seq.

Calyx. *Hawk-weed*, *Sow-thistle*, and many other syngenesious plants, furnish beautiful instances of this species of Calyx.

Sometimes the scales of the Calyx spread wide, being diffused on all sides, and not closely laid over each other, as in the preceding species; this last is the *Perianthium squarrosum*, or *Squarrose calyx*; of which we have examples in the *Thistle*, *Onopordum*, *Conyza*, &c.

In some plants, as in the *Pink*, *Coreopsis*, and others, the base of the Calyx, which is simple, is surround' d externally by a series of distinct leaves, which are shorter than its own; to this species of Calyx, Linnæus has given the name of *Calyx auctus*, and Professor Vaillant, *Calyx calyculatus*, an increased Calyx, or a calyceled Calyx.

The *Perianthium scariosum*, or scariose Perianth, is a species of Calyx, which is tough, though thin, and semi-transparent; as in *Statice Armeria*, or Thrift; *Centaurea glastifolia*, &c.

The *Perianthium turbinatum*, is inversely conical, shaped somewhat like a Windsor pear; the *Grislea secunda* and *Memecylon capitellatum*, exhibit instances of this kind of Perianth.

The Perianth is also either proper or common.

Proprium, or proper, when belonging to but one flower; and

Commune, or common, when belonging to several flowers, collected together.

Some flowers, such as the *Amaryllis*, the *Tulip*, the *Lily*,* the *Medeola*, and many others of the liliaceous plants, are, by the strict Linnæan principles, considered to be destitute of the Perianth. This doctrine has been combated by many very intelligent botanical writers, and it may be admitted, that, as in many cases the Calyx and Corolla pass so insensibly into each other, it is not improbable Linnæus did not take the most minute care to observe, or was unable, like many of the present day, to determine where the Calyx ended and Corolla began. There will be opportunity, under the head of Corolla, to investigate this subject more closely.

In the greater number of plants the Perianth is single; but, in *Morina*, *Sarracenia*, and some of the plants of the *Mallow* family, as *Althæa*, *Alcea*, *Malva*, *Lavatera*, *Gossypium*, *Hibiscus*, &c., it is double.

The second species of Calyx is the *Involucrum*.† This is called by Dr. Martyn, *Involucre*. It is chiefly restricted by Linnæus to the umbelliferous flowers, and is defined by him, as a Calyx removed from the flower. But, that it is found on

* See Fig. 1, Plate 6.

† From the Latin word *involvere*, to involve, roll about, or wrap up.

other plants not umbelliferous, we have sufficient evidence, as in one or two species of the *Anemone*, and the *Passion-flower*. In the first of these, the involucre is numerously subdivided for the protection of the Corolla during the earlier stages of its life, at which period the flower droops; but as the plant advances to maturity, the Corolla becomes erect upon its stalk, and the involucre is then found situated about an inch or more below the flower and surrounding the stem.

In the *Passion-flower** there are three leaves, which are about the fourth of an inch remote from the *Perianth*, and are hence called leaves of the involucre; this has by some been called a double Calyx, and so in a certain sense it is, but the inner Calyx alone is the true *Perianth* of the flower; the other is properly called the involucre.

These exceptions, however, do not weaken the authority of Linnaeus; and when he called the involucre a Calyx removed from the flower, he obviously meant that it was remote from the Corolla, and placed below the common receptacle, at the foot of what is called an Umbel;† (a

* See Plate 14, letter *e*.

† Umbelliferous is derived from the Latin word *Umbella*, a little shade, and *fero*, to bear.

collection of flower-stalks, diverging from one point, and each rising to the same height. Each of the foot-stalks is terminated by an Umbel, which is similar in its form and structure to the large Umbel, and is commonly, like it, furnished with an involucre.) When a Calyx of this kind is placed under the universal Umbel, it is called, by Linnæus, *Involucrum universale*, an universal involucre; when it is placed under the smaller or partial Umbel, it is denominated *Involucrum partiale*, a partial involucre; but neither of these are always present: in *Chærophyllum* (Cow-parsley), the partial involucre only is present; and in the *Pastinaca* (Parsnip), neither universal nor partial involucre is seen. This organ has been called *Involucellum*, or involucret; and, by Dr. Withering, the *Partial Fence*.

In most of the umbelliferous flowers, such as the *Hemlock*, *Fennel*, *Anise*, and in other plants not strictly umbelliferous, as the *Cornus sanguinea*, English-dogweed, and other species of this genus, there is, besides the involucres, a proper perianth, which is situated under each of the florets, or small flowers, of which the Umbel is composed.

The involucre, as being composed of one or more leaves, receives its name accordingly, for example:

Involucrum monophyllum, a one-leaved involucre, as in *Bupleurum* (Thorough wax).

— *diphyllum*, a two-leaved involucre, as in *Euphorbia* (Sponge).

— *triphyllum*, a three-leaved involucre, as in *Butomus* (Flowering-rush), and the *Alisma* (Water-plantain).

— *tetraphyllum*, a four-leaved involucre, as seen in *Cornus*.

— *pentaphyllum*, a five-leaved involucre, as in *Daucus* (Carrot).

— *hexaphyllum*, a six-leaved involucre, as in *Hemanthus*, &c. &c.

— *dimidiatum*, dimidiate, or half-leaved involucre, is that which is deficient on one side; as in *Aethusa* (Fool's parsley).

As the involucre does not in many cases cover or enclose the rest of the parts of fructification previously to the opening of the flower, as is the case with the proper Calyx, it is difficult to say in what essential circumstance the involucre of those plants which are not umbelliferous, such as *Cornus* and some species of the *Anemone*, differs from the bractæ; and it would seem that Linnæus's principal reason for separating the involucre from the bractæ was this, that he

might make use of the former in drawing his generic characters of the umbelliferæ. There can be little doubt that he adopted this separation and distribution, in deference to the authority of Artedius, by whom it was first proposed; and, having adopted it, he was obliged, in defiance of all analogy, to call the involucre a species of Calyx, as he would otherwise have violated his established principle of drawing his generic characters from some part of the fructification.

The *Amentum** or *Ament*, is a questionable species of Calyx, which consists of a great number of chaffy scales, and which are dispersed along a slender thread, or receptacle; it has also been vulgarly called a Catkin, on account of its supposed resemblance to a cat's tail, (though the resemblance is as strong to the tail of many other animals as to that of a cat.) The French call it *Chaton*; and many botanists have denominated it *Catulus*.

The term, *Ament*, will be found to have been used by the great Tournefort before it was employed by Linnæus; and it is synonymous with the terms *Julus* and *Nucamentum*, which are employed by some writers. *

* *Amentum* is derived from the Greek word *αμμα*, *Amma*, a whip or thong.

Linnæus defines the Ament to be a composition of a Calyx, and a common receptacle; a fine specimen of which is seen in the *Betula populi-folia*.

It is clearly a species of inflorescence: the true Calyx is the squama or scale, to the interior concave side of which, the stamens and pistils are either jointly or separately attached, and by which, with the assistance of the common elongated receptacle, they are at first completely covered.

Examples of the Ament frequently occur in the 21st and 22d classes *Monœcia* and *Diœcia*,* the particular characters of which will be explained in the Fourth Part.

In this place, however, it is proper to observe that in the first mentioned class, the Ament supports both male and female flowers on the same root, or individual; this is seen in the *Horn-beam*, *Walnuts*, *Hickeries*, *Chesnut*, *Chinquëpin*, and many others.

In the class *Diœcia*, the Ament supports male and female flowers on distinct roots, or individuals, and this is the case in *Willows*, *Poplars*, and many others. The class also contains some plants, such as the *Pistachia-nut*, *Juniper-tree*, and *Ephedra* (Shrubby horsetail), the male flowers of which are formed into an Ament;

* See Plate 16.

whilst the female flowers are surrounded with a Perianth.

It not unfrequently happens, that in plants of the class *Monœcia*,* the male and female flowers are situated very close to each other; whilst in others they are separated to a considerable distance, but in both instances they are found upon the same root, or individual.

In the latter case, the Ament frequently supports flowers of one sort, while a calyx or perianth-kind supports the other. Thus, in the *Corylus*, or Hazel, the male and female flowers are placed remote from each other, upon the same root or individual; the male flowers form an ament, whilst the females are enclosed in a perianth.

Wherever the ament contains seeds, it hardens and enlarges, and thus affords a permanent protection to them until ripe: but where the ament contains the stamens only, it falls off as soon as the *anthers* have deposited their farina or pollen. The fir is an instance of the former kind, and the hazel of the latter. Nature has wisely ordained in these plants, producing both male and female flowers, that for their reproduction, the flowers should appear before the leaves, so that the farina or pollen of the *anthers* may be carried more securely by the

* See Plate 15.

winds, or may be more directly deposited by their own gravity or the *pistilliferous flowers*.

The *Spatha*, or Spathe, is derived from the Latin word *spatha*, meaning a sheath or scabbard. In *Palms* and *Aroideæ*, the Spatha is seated at the base of the spadix and wholly enwraps it. Professor Link considers it a modification of the petiole. The *Arum Maculatum* (lords and ladies), of the hedge-banks, is a beautiful example of the spatha; it bursts longitudinally, exhibiting its stem and flowers most conspicuously.

Linnaeus enumerates the following species of this organ.

- Spatha univalvis*, one-valved spatha or a spathe, composed of one leaf, as in *Narcissus poeticus*, *Galanthus nivalis* (Snow-drop), *Arum*, and others.
- *bivalvis*, two-valved spatha or a spathe, composed of two leaves; as in *Stratiotes* (Water soldier).
- *imbricata*, imbricate spathe, or one composed of a number of scales placed similarly to the scales on a fish, as in *Musa*, or Plantain-tree.

According to the number of flowers which it produces, the spathe has received the following names.

Spatha uniflora, one-flowered spathe.

— *biflora*, two-flowered ditto.

— *multiflora*, many-flowered ditto.

The *Gluma*, or Glume; this is derived from the Latin word *gluma*, chaff, and is a species of calyx restricted to the gramina, or grasses; it is formed of valves, and embraces the seed, from which circumstance it might fairly be deemed more more scientific as well as more consistent to use the term *valvula* (valve); but, unfortunately, long-established error is difficult to be subverted, and many who were formerly advocates for this desirable substitution have ceased to be so.

This species of calyx which is also called the Husk, is frequently terminated by a stiff-pointed prickle, called the awn, or beard: according to the number of flowers the glume supports, it has received different names: such as

Gluma uniflora, one-flowered glume.

— *biflora*, two-flowered glume.

— *triflora*, three-flowered glume.

— *multiflora*, many-flowered glume.

Various appellations have also been given to the glume, corresponding with the number of its valves, viz.:

Gluma univalvis, univalvular, or one valved glume.

— *bivalvis*, bivalvular, consisting of two scales

or valves: and this is the most common species of glume.

Gluma multivalvis, multivalvular, or many valved glume; having more than two scales or valves.

The glume is generally green, if it varies it is called *colorata*, coloured.

The surface in some plants is *glabra*, smooth; and in others *hispida*, hisped, rough, and covered more or less with pili.

The *Calyptra*,* or calyptræ, is a doubtful species of calyx in the mosses covering the anthers. It resembles a hood, monk's cowl, or an extinguisher; it is to be observed that what Linnæus calls the anthers of the mosses, are generally and more properly considered as their capsules, or pericarps. In the process of vegetation, the most central of these bodies swells and bursts its membraneous covering, the greater part of which is carried upwards on its point, while the seta, or (stalk,) on which the (theca) or capsule is supported lengthens.

The *Volva*,† or Ruffle, as Dr. Withering has called it, is defined to be the membranaceous calyx of a fungous plant. It is the covering of several sorts of mushrooms, which enfolds the

* Calyptra, from καλυπτω, to cover.

† Volva, from volvere, to roll round.

laminæ; (gills;) this bursting from the edges of the pileus, (hat,) as the plant enlarges, afterwards rolls round the pedestal, affording a resemblance to a ruffle or fringe. The edible mushroom is, therefore, easily distinguished from the poisonous fungi, which, having no calyx, (*volva*,) their gills are visible, even when in the form of buttons, and their stems are devoid of this frill or volve, or of the ring-like mark it would leave if off.

The *volva*, when placed upon the mushroom near the cap, is called *approximata* or approximating.

When it is at a distance from the cap, it is called *remota*, or remote.

This calyx either falls off at the first opening of the plant, after its full expansion, or continues with the seed. The terms employed to express these periods of duration are *caducous*, *deciduous*, *persistens*.*

Examples of the Calyptra and Volva are in the lower divisions of Plate 18.

Secondly,—The *Corolla*;† this has been denominated, by some writers,‡ *corol*; it is the second of the seven parts of fructification already

* For an explanation of which terms see p. 27, &c. on leaves.

† Corolla, in the Latin, literally signifies a little crown, garland, chaplet, or coronet.

‡ Dr. Darwin particularly.

enumerated, and is defined by Linnæus in one part of his writings to be “the liber or inner bark of the plant present in the fructification.”*

Some writers have rendered the term *corolla* by blossom:† but Dr. Martyn has observed, that blossom has too contracted a signification; being usually and more properly applied to the flowers of fruit trees alone. The petals of the *corolla* have frequently been called, both in common language and in the writings of poets and philosophers, “the leaves of the flower.” Thomson, Rittenhouse, and many others, may be quoted in proof of such; but this language is not sufficiently precise and specific for the purpose of science; and to avoid ambiguity, the term *corolla*, as derived from the Latin, should be continued, and the term *petal* as applied to the segments of the *corolla*, not departed from.

The *corolla*, according to Linnæus, consists of two parts, namely: the *Petolum* or *petal*, and the *Nectarium*, or Nectary. This last, however, is not always a part of the *corolla*.

Approximation of the Perianth to the Corolla.

In general, the *corolla* may be distinguished from the *perianth*, by the fineness of its texture and the brightness of its hue, the *perianth* (*calyx*), being usually thicker, rougher, and of a green colour.

* *Philosophia Botanica*, p. 52.

† Among whom is Professor Rennie.

To this rule, however, there are many exceptions: thus, in *Bartsia coccinea*,* the perianth is more deeply coloured than the corolla; the perianth of the *Fuchsia coccinea*, is a bright scarlet, and the corolla an indigo; the perianth of *Dombeya lappacea*, before the opening of the flower, is of a crimson colour, it afterwards becomes green, and the corolla is of a brownish violet colour; these instances are reversed in the *Daphne Laureola*, the corolla of which is green, and the calyx coloured; and in the *Bignonia radicans* (trumpet flower,) the perianth and the corolla are both of the same colour. It is, therefore, necessary, to have recourse to other marks by which these two parts of the fructification may be accurately discriminated.

Linnæus makes the distinction between the corolla and the perianth to consist in this circumstance, that the former has its segments or petals disposed alternately with the stamens; whereas the perianth has its leaflets arranged opposite to the stamens.

Dr. Milne, in his Botanical Dictionary, under the article Corolla, says "That this rule is founded on the natural situation of the parts in question, as will appear, by examining any number of

complete flowers, in the fourth and fifth class of the Linnæan method: in the former of these classes, the number four, in the latter, the number five is predominant; and as both Perianth and Corolla are present, the opposition and alternation alluded to become distinctly visible."

Notwithstanding this, there is, on very many occasions, a great difficulty in distinguishing the corolla from the perianth; and in the *Philosophia Botanica*, pages 57 and 58, section 90, we find Linnæus himself renouncing his former opinions, and confessing that nature does not seem to have placed absolute limits in all cases between the calyx (perianth), and the corolla.

This can scarcely be denied; especially if it be untrue, that the calyx is exclusively derived from the outer, and the corolla from the inner bark: here is ample room for research, but not for speculation.

The learned Jussieu defines the corolla to be "That cover of the flower which is surrounded by the calyx, or which is very rarely unenclosed," he says, it is a continuation of the liber, or inner bark, and not of the cortex or outer bark of the peduncle: that it is not permanent, but commonly falls off with the stamens, which involves or crowns the fruit, but never grows fast to it; and which almost always has its segments or divisions ranged alternately with the stamens."

From this view of the subject, the coloured petals of the Narcissus, Hyacinth, and other liliaceous plants nearly allied to the Narcissus, are regarded by Jussieu as forming a true perianth; as indeed Tournefort had taught long before. Necker, too, sensible of the great difficulty which not unfrequently occurs in distinguishing the corolla from the calyx, has, in his *Corollarium ad Philosophiam Botanicam Linnæi spectans, &c.*, called both the corolla and the calyx by one name, viz.: *Perigynandra*, a term derived from the Greek, and signifying an envelope; he distinguishes the *Perigynandra*, when there are two such envelopes into the outer and the inner, the inner answering to the corolla, and the outer to the calyx of Linnæus.

The petals, under every arrangement, constitute the principal part of the corolla, and surround both the stamens and the pistils. They consist of one or more pieces, according to the number of which, the corolla has received the following names, viz.:

Corolla monopetala, monopetalous, or consisting of but one petal, as in the *Convolvulus** *Tobacco*,* and many others.

— *dipetala*, dipetalous, or consisting of two petals.

* See Frontispiece.

Corolla tripetala, consisting of three petals, as in *Sagittaria*,* &c.

— *tetrapetala*, of four petals, as in the plants of the class *Tetradynamia*.

— *pentapetala*, of five petals, as in marsh-marygold, the *umbellatæ*, &c.

— *hexapetala*, of six, as in the lily,† &c.

— *polypetala*, polypetalous, or consisting of many petals.

This last term is sometimes used by Linnæus, in opposition to the term *monopetalous*, and by many writers, it has been employed to describe a corolla of more than six petals. Of the polypetalous plants, some have nine petals, as in *Liriodendron*, and some an indefinite number, as in the *Water-lily*, and *Globe-ranunculus*.

When the corolla consists of only one piece, as in the *monopetalous* corolla, the whole corolla, in the Linnæan sense of the word, is a petal.

A flower which has no petals or corolla, is termed, *apetalous*; or *apetalous flos*, an apetalous flower. This term was adopted by Linnæus, from Tournefort; it is equivalent to the term *imperfectus*, or imperfect of Rivinus, Knaut, and Pontedera: the term *stamineus* of Ray; the *incompletus* of Vaillant; and the *capillaceous* of some other *Botanical* writers.

* Plate 15.

† See Fig. 1, Plate 6.

The existence of apetalous flowers has been denied by Christian Knaut, in his *Methodus Plantarum Genina*; but it is well known, that in some vegetables the flowers are entirely destitute of the petals; and if the opinions of Jussieu and some other botanists, concerning the calyx* and the corolla, be correct, it must be granted, that very many plants and some of them the most beautiful with which we are acquainted, are strictly apetalous.

The number of petals of which a Corolla consists is determined from the base of the corolla. The rule of Rivinus is to reckon as many petals as the parts into which the flower, when it falls, resolves itself. This criterion will, in most instances, be found very exact, but in some few cases it will be insufficient. The corolla of the *Vaccinium Oxycoccus* (Cranberry), has, unquestionably, only one petal; but the flower, upon falling off, resolves itself into four. From the difficulty that occurs in some instances, of determining whether a corolla consists of one or more petals, we find Tournefort considering the corolla of plants of the Mallow tribe to be *monopetalous*; whilst Linnæus regarded it as *pentapetalous*.

* Perianth.

The different parts of the Corolla are distinguished by different names, for example :

- The *tubus*, or tube, is the lower part of a monopetalous Corolla; as in Tobacco, &c.
- *unguis*, or claw, is the lower part of a many petalled Corolla, by which it is fixed to the receptacle; as in the Lily, &c.
- *limbus*, or limb, is a term sometimes used, but improperly; for that to which it is applied is a border, or the upper dilated part of a monopetaious Corolla.
- *lamina*, which literally signifies a plate of metal beaten out thin by a hammer, is, in botanical language, applied to an upper border, or an expansion at the upper part of a many-petalled Corolla.

DIVISIONS OF THE COROLLA.

The Corolla in this respect may be

Bifida, bifid or two-cleft; each petal divided into two; as in Chickweed, &c.

Trifida, or three-cleft, each petal divided into thrce; as in *Holosteum succulentum*, and *Hypecoum*.

Tetrafida, four-cleft; as in *Cucubalus* and *Lychnis flos cuculi*.

Quinquefida, five-cleft; as in *Primula* (*Primrose*), *Lysimachia*, &c.

Multifida, many-cleft; as in *Trientalis Europæa* (Winter-green), this term is equivalent to the term *lacineatus flos*, (of Tournefort.)

Bipartita, two-parted; simple, but divided almost down to the base; as in *Stellaria* and *Cerastium*.

Tripartita, three-parted; simple, but divided into three parts almost down to the base.

Laciniata, laciniated; divided into segments, as in *Reseda* (Mignonette.)

REGULARITY OR EQUALITY OF PARTS.

In this respect the Corolla may be

Régularis, regular; that is, equal in the figure, size, and proportion of the parts; as in the Privet, Lilac, Jasmin, &c.

Irregularis, irregular; when the parts of the limb differ in figure, magnitude, or proportion, as in *Aconite*, *Lupin*, and *Dead-nettle*.

Inæqualis, unequal; having the parts corresponding not in size, but in proportion; as in *Butomus umbellatus*.

Æqualis, equal; when the petals are of the same size and figure; as in *Primula*, *Limosella*, &c.: there does not appear to be any essential difference between the terms *æqualis* and *regularis*; and, as Dr. Martyn has observed, the latter expresses the idea better.

Difformis, difform; anomalous, or irregular; when the petals, or their segments, are of different forms.

FIGURE OF THE COROLLA.

Globosa, globose, globular, or spherical; round like a ball; as in *Trollius* (*Globe-ranunculus*.)

Campanulata, campanulate; bell-shaped, protruding without any tube, as in the *Campanula*, *Convolvulus*,* *Antropha*, and others.

Infundibuliformis, funnel-shaped; having a conical border rising from a tube; as in *Lithospermum*, *Stramonium*, *Tobacco*,† &c.

Hypocrateriformis, salver-shaped; rising from a tube with a flat border; as in some of the plants called *Asperifoliæ*; in *Diapensia*, *Aretia*, *Androsace*, *Hottonia*, *Phlox*, *Samolus*, &c.

Rotata, wheel-shaped; spreading flat without any tube, and radiating from one centre; as in *Borago*, *Veronica*, *Physalis*, *Verbascum*, and others.

Cyathiformis; cylindrical, but widening a little at the top.

Urceolata, pitcher shaped.

Ringens, irregular, gaping; a one-petalled Corolla, the border of which is commonly divided

* See Fig. 2, Frontispiece.

† See Fig. 1, Frontispiece.

into two parts, the one longer than the other ; the upper division is sometimes called the *galea*, or helmet; the latter, the *barba*; most of the flowers of the fourteenth class are furnished with this species of corolla.

Personata, personate, or masked ; as in *Antirrhinum* (Snap-dragon.)

Cruciata or cruciformis, cross-shaped, consisting of four equal petals, which spread out in form of a cross. This species of Corolla is exemplified in most of the plants of the fifteenth class.

Papilionacea, or Butterfly-shaped ; irregular, and most commonly consisting of four petals ; as in *Pisum* (Pea), *Vicia* (Vetch.)

Rosacea, rosaceous, or rose-like ; consisting of four or more regular petals, which are inserted into the receptacle by a short and broad claw ; as in the Wild-rose.

Undulata, waved or undulated, but not in angles, as in *Gloriosa superba*, and *Gloriosa simplex*.

Plicata, plaited, or folded like a fan ; as in *convolvulus*.

Revoluta, revolute ; rolled back or downwards ; having the petals rolled back, as in *Asparagus*, *Medeola*, and *Lilium*.*

Torta, twisted ; as in *Nerium*, *Aselecpias*, *Vinca* (Periwinkle,) &c.

* See Fig. 1, Plate 6.

MARGINS OF THE COROLLA.

These may be either

Crenata, crenate; as in *Linum*, *Dianthus*, *Chinensis*, &c.

Serrata, serrate; as in *Tilia*, *Alisma*, &c.

Ciliata, *ciliate*; as in *Rue*, *Menyanthes*, *Tropæolum*, *Gentiana ciliata*, &c.

SURFACE OF THE COROLLA.

In respect of its surface the Corolla is *villosa*, *tomentosa*, *sericea*, *pilosa*, *barbata*, *imberbis*, or *cristata*.*

SITUATION OF THE COROLLA.

In respect to its situation, the Corolla is—*supra*, superior; by having its receptacle above the germ: or *Infera*, inferior, by having its receptacle below the germ.

DURATION OF THE COROLLA.

In point of duration, the Corolla is *caduca*, continuing only until the expansion of the flower, and then falling off; *decidua*, when the petals fall off with the rest of the flower; *persistens*,

* Each of these terms has been explained under the head of the Nomenclature of Leaves, to which, at page 27 et seq., the reader is referred.

permanent, continuing until the fruit has attained maturity; and *marcescens*, (withering on the stock, without dropping; as in Campanula, Orchis, Cucumber, Gourd, Bryony, &c. &c.)

In some plants, even of the same species, the Corolla is very transitory; in others, it is more permanent. We are not acquainted with all the circumstances which thus essentially affect the longevity of the Corolla; it is, however, a well-known fact, that double flowers, in general, last much longer than single ones. Thus, in single Poppies, the Corolla falls off in a few hours, whilst in double ones it lasts for several days. The double blossoms of the Cherry last much longer than the single blossoms of the same tree.

COMPOSITION OF THE COROLLA.

In respect to its composition, the Corolla is

Composita, compound; consisting of several florets, included within a compound Perianth, and resting upon a common receptacle.

Ligulata, ligulate; or strap-shaped; when the florets have their corollets flat, spreading out towards the end, with the base only tubular.

Tubulata, tubulous; when all the corollets of the florets are tubular, and nearly equal.

Radiata, radiate; consisting of a disk, in

which the corollets or florets are tubular and also regular; and of a ray, in which the florets are commonly ligulate.

COLOUR OF THE COROLLA.

The Corolla, in different vegetables, assume every known colour.

THE NECTARIUM.

The *Nectarium*, or Nectary, is, according to Linnæus, the second part of the Corolla. It is considered by him as the melliferous part of the vegetable, secreting or containing a peculiar fluid which constitutes the principal food of bees, and various other species of insects.

By some writers, this organ has been called the "Honey-cup;" but this name cannot be applied to all species, since, in many plants, this part bears no resemblance whatever to a cup, or vessel of any kind. To the term Nectary, as a generic term, and equivalent to the Latin *nectarium*, there is less objection, especially as the word nectar, applied to a liquor of delicious flavour, is so familiarized in poetic language.

FORM OF THE NECTARY.

The Nectary assumes a variety of forms, in different species of vegetables. Thus, in many

flowers, it is shaped like the spur of a fowl. This is the

Nectarium calcaratum, of which we have examples in the following vegetables, viz. *Valerian*, *Hooded-Milfoil*, *Butter-wort*, *Larkspur*, *Violet*, *Fumatory*, *Balsam*, and *Orchis*.

A second form is that of a purse, somewhat globular, with a depressed line in the middle.

The *Nectarium ovatum*, is an egg-shaped Nectary.

— *turbinatum*, a turbinate Nectary.

— *carinatum*, a keeled Nectary; this kind being entirely distinct from the petals, is denominated *Nectarium proprium*, or a proper Nectary.

Sometimes the Nectary is really a part of the Corolla, since it lies within the substance of the petals. The following plants afford instances of this kind of Nectary, viz. *Fritillaria*, *Lilum*, *Swertia*, *Iris*, *Hermannia*, *Uvularia*, *Hydrophyllum*, *Myosurus*, *Ranunculus*, *Bromelia*, *Erythronium*, *Berberis*, and the *Vallisneria*. This is what Linnæus calls *Nectarium*, *Petallinum*, or *Petalline* Nectary.

In many plants, the Nectary is placed in a series of rows within the Petals, or Corolla, and yet is entirely unconnected with their substance; a Nectary, thus situated, is said, by Linnæus, to crown the Corolla. The following plants, among

many others, furnish examples of this kind of Nectary; viz. *Passiflora*,* *Narcissus*, *Pancreatium*, *Ola*x, *Lychnis*, *Silene*, *Stapelia*, *Asclepias*, *Cynanchum*, *Nepenthes*, *Cherleria*, *Clusia*, *Hamamelis*, and *Diosma*.

In the following plants, the Nectary is situated upon, and makes a part of the Calyx, instead of the Corolla, viz. *Tropæolum*, *Monotropa*, *Biscutella*, and *Malpighia*; in these the Nectary is called, *Nectarium calycinum*, or Calycine Nectary.

In some plants, the Nectary is situated upon the Anthers, or summits of the Stamens; from which circumstance one of the plants has received the generic name of *Adenantha*ra.

The Nectary of many plants is placed upon the filaments. This is the case in *Laurus*, *Dictamnus*, *Zygophyllum*, *Commelina*,† *Mirabilis*, *Plumbago*, *Campanula*, *Roella*, and others.

In the following plants, the Nectary is placed upon the germ, or seed-bud; viz. *Hyacinth*, *Flowering-rush*, *Stock*, and *Rocket*. This is the *Nectarium pistillaceum*, or pistillaceous Nectary.

In *Honey-flower*, *Orpine*, *Buck-wheat*, *Collinsonia*, or *Horse-weed*, *Lathræa*, *Mercury*, *Clutiæ*, *Kiggelaria*, *Sea-side Laurel*, and several others, the Nectary is placed upon, or attached

* See Plate 14.

† See Fig. 1, Plate 5.

to the common receptacle. This is the *Nectarium receptaculaceum*, or receptacular Nectary.

Linnaeus considers as a true Nectarium, the tube, or lower part of the monopetalous, or one-petalled flowers; such as the *Datura*, *Nicotiana*,* &c.; because, in general, this part contains, and probably forms the sweet or honied liquor, which constitutes one of the alimentary articles of bees and other insects.

In many plants, such as *Ginger*, *Turmeric*, *Reseda*, *Grewia*, *Nettle*, *Vanilla*, *Willow*, and others, the Nectary is of an unusual construction, and cannot, with propriety, be referred to any of the preceding heads.

Among writers opposed to Linnaeus, there has frequently been a disposition to regard him as less happy in his history of the Nectarium, than in his account of most of the other parts of the vegetable; and notwithstanding his position, that the Nectary is a part of the Corolla, it is certain that all flowers are not provided with this organ or appendage; and in many plants which possess it, there is no immediate connexion between the Nectary and the Corolla.

Upon the whole, the term *Nectarium* is an extremely vague one; and much deference is due to the judgment of Jussieu, who said, "the term

* See Fig. 1, Frontispiece.

ought to be rejected from the science of botany." It is greatly to be wished that some person, possessed of the requisite qualifications, would enter upon a careful investigation of the various species of Nectarics, and arrange them under some more appropriate names than those by which they are at present recognized. In studying the genera of plants, a correct knowledge of the various Nectaria is of very essential service. In some cases, indeed, it is indispensable: this is shewn in the genus *Ranunculus*, the essence of which consists in its Nectary, which is a small prominence, situated at the unguis, or claw, of each petal of the plant.

THE STAMEN.*

The *Stamen*, which some writers have called the *Chive*, is defined, by Linnæus, to be "an organ for the preparation of the Pollen."

In most flowers, the stamens are seated round the seed-bud, and consists, according to Linnæus, of three parts; the *Filamentum*, the *Anthera*, and the *Pollen*. In reality, however, the stamen consists of only two parts, the *Filamentum* and the *Anther*; the Pollen being merely a matter secreted by, or contained in, or upon, the Anther.

* The word Stamen is derived from the Latin *stane*.

THE FILAMENTUM.

The *Filamentum*, or Filament, and which receives its name from the Latin word *Filum*, a thread, is the more slender, or thread-like part of the *Stamen* which supports the Anther, and connects it with the flower. The term Filament is equivalent to that of *Stamen*, as employed by *Tournefort* and some other botanists.

The number of Filaments varies considerably in different vegetables. Some plants have but one *Filament*, some two, some three, while others have from twenty to a thousand.

FIGURE OF THE FILAMENT.

In point of figure, the *Filament* is *Capillare*, *Planum*, *Wedge-shaped*, *Spirale*, *Subulatum*, *Emarginatum*, *Reflexum*, *Lacinatum*, *Dentatum*,* *Mutilatum*, (mutilated, or having the rudiments only of a Filament;) and, lastly, *Barren*, and which is applied in cases of the absence of the Anther, or when a Filament has elevated one not charged with Pollen, as in some species of *Geranium*.

* For explanations of these terms, refer to Nomenclature of Leaves, page 27 et seq.

INSERTION OF THE FILAMENTS.

In regard to insertion the Filaments are,
Calyci opposita, opposite to the leaflets or segments of the Calyx.

Calyci alterna, alternate with the Calyx, or placed alternately with the leaflets of the Calyx.

Corollina, inserted into the Corolla.

Calycina, inserted into the Calyx.

Receptaculacea, inserted into the Receptacle.

Nectarina, inserted on the Nectary.

Stilo inserta, inserted on the Style, as in the plants of the class *Gynandria*.

PROPORTION OF THE FILAMENT.

In point of proportion the Filaments are

Æqualia, equal, all of the same length.

Inæqualia, unequal, some longer than others.

Connata, connate, conjoined into one body, so as to form a tube at the base; as in the plants of the class Monadelphica.

Longissima, very long, longer than the corolla.

Brevissima, very short, much shorter than the corolla.

Longitudine corollæ, of the same length as the corolla.

Longitudine calycis, of the same length as the calyx.

SURFACE OF THE FILAMENT.

In respect to its surface, the Filament is

Pilosum, hairy.

Villosum, villous.

Hirsutum, hirsute.

STRUCTURE OF THE FILAMENT.

As to its structure the Filament is *membranaceum*, membranous; or *nectariferum*, nectariferous.

DIRECTION OF THE FILAMENT.

In regard to its direction, the Filament is

Erectum, erect.

Patens, spreading.

Patentiusculum, somewhat spreading.

Patentissimum, very much spreading.

Arcuatum, in the form of a bow.

Connivens, converging, approaching the other filaments with the point.

Reflexum, reflected.

Declinatum, declined.

Inflexum, inflected.

Flaccidum, flaccid.

Assurgens, up-springing.

Ascendens, ascending.

Recurvum, recurved.

Incurvum, incurved.

THE ANTHER.

The Anther is the second part of the Stamen.

This is the part which Ray denominates the *Apex*, and Malpighi calls a *Capsula staminis*; the word *Anther*, however, is preferable: Linnæus defines it to be “a part of the flower charged with pollen, or loaded with farina.” Both these powders to the unassisted vision, are impalpable, (though the former is much the finer,) but viewed through a microscope of a high power, they are discovered to be composed of innumerable semi-transparent substances of various forms, in which, according to some writers, the embryo of the future plant is clearly observable. If this is to be relied upon, and there seems little room for doubt, the *pistillum* may be regarded as an organ whose only office is to protect and to nourish the pollen, which most decidedly is both of an exhalent and an absorbent quality.

It is exhalent, from throwing out humidity, and obtaining in return very large quantities of oxygen; from which it not only derives a vivific influence, and an expansive property, but also occasionally become specifically

too heavy for the filaments to support in their usual position.

It is absorbent, not only by imbibing the oxygen as above stated, but also from absorbing all the nectareous or mucilaginous fluid afforded by the anther, and by which the adhesive quality is destroyed: the means of connexion being thus annihilated, and an explosion of the anthers resulting from the expansive property acquired, the pollen becomes liable also to be scattered by the winds, and find protection from the pistils of various plants; this is the indirect yet general method by which the reproduction of vegetables is carried on; the other mode results apparently from the increased weight of the filaments above referred to, by which the filament is forced into an *Arcuatum*, or bow-like form, whereby the farina, (for protection only,) is more directly deposited upon the germ of the pistilliferous flowers.

The Anther, therefore, may be defined to be a vessel destined, for a season, to sustain in the most liberal sense of the word, the pollen. It commonly forms a part of the stamens, and is usually placed upon the top of the filament; but, it must not be forgotten, that in many plants the anther exists without any filament to support it.*

* This important subject will be further considered when the pistillum comes under consideration.

The number of anthers varies in different plants. The generality have one to each filament: to this rule the following plants are exceptions, viz.:

Mercurialis, or Mercury, and the *Ranunculus*, have two anthers to each filament; this is what Linnæus calls a twin-anther, (*anthera didyma*.)

Fumaria, has three to each.

Bryonia, has five anthers to three filaments, in this, a single anther is affixed to one of the filaments, and the remaining four anthers are equally divided between the other two filaments.

In the *Theobroma* or chocolate-nut, there are five anthers to each filament.

The *Pea*, *Bean*, *Vetch*, *Trefoil*, *Liquorice*, and many other flowers of the class *Diadelphia*, have, in general, ten anthers to two filaments; or, more properly speaking, to two sets of united stamens.

In the *Cucurbita*, or Gourd, there is one anther attached to three filaments.

In the *Dandelion*, *Fever-few*, *Groundsel*, and other really compound flowers, of the class *Syngenesia*, there are five anthers, which are united into a cylinder, to which is connected five distinct and separate filaments.

In some plants, some of the filaments are terminated by anthers, whilst others are destitute of these parts; thus, the two genera *Chelone*

and *Martynia*, are furnished with four complete stamens, together with the rudiments of a fifth filament, which is destitute of the anther. The *Verbena* has four filaments, two only of which are antheriferous. The *Bignonia Catalpa* of Linnæus, has two perfect stamens, or stamens with anthers; and three filaments which have no anthers.

FIGURE OF THE ANTHER.

In point of figure the Anther is

Oblonga, globosa, sagittate, angulata, cornuta, bicornis, linearis, acuta, acutiuscula, cordata, ovata, hastata, biloba, reniformis, bifida, bipartita, aristata, setifer, rostrata, truncata, obtusa, emarginata, acuminata, and furcata.

DIRECTION OF THE ANTHER.

In regard to direction the Anther is

Erecta, rigida, patens, assurgens, inflexa, nutans, declinata, pendula, incurva, connivens, and spiraliter-contorta.

INSERTION OF THE ANTHER.

As to insertion, the Anther is

Sessilis, versatilis, adnata, cylindræa, tubulatæ, (as in the compound flowers of the class *Syngenesia*,) *cohærentes, incumbens, and lateralis.*

SUBSTANCE OF THE ANTHER.

In respect to substance the Anther is

*Membranacea, depressa, compressa, convexa, plana, sulcata, transversim sulcata, longitudinaliter sulcata, subulata and bilamellata.**

PROPORTION OF THE ANTHER.

In reference to measure the Anther is

Filamentis brevior, shorter than the filament.

Corolla brevior, shorter than the corolla.

Longitudine filamenti, of the same length as the filament.

Longior filamenti, longer than the filament.

Æquales or equal, when the anthers are all of the same size.

Longissima, very long, much longer than the filament.

Brevissima, very short, much shorter than the filament.

PROTECTION OF THE ANTHER.

In point of protection the Anther is

Tecta, covered, concealed by a scale of the arch, as in the *Asperifoliæ*, or rough-leaved plants,—

* Most of these terms have been sufficiently explained at page 27 et seq., under the head of the Nomenclature of Leaves.

Or *Inclusa*, enclosed, situated within the tube of the corolla;—but we also find very many anthers perfectly unenclosed.

CELLULAR CHARACTER OF THE ANTHER.

In regard to its cells and apertures the Anther is

Unilocularis, one-celled.

Bilocularis, two-celled.

Trilocularis, three-celled.

Bivalvis, two-valved.

Didyma, didymous, having its surface divided into two equal protuberances.

Sterilis, not possessing pollen.

Fertile, possessing pollen.

Apice, dehiscens, opening at the top.

Latere dehiscens, opening at the side; and Linnæus denominates the bursting of the anthers *Dehiscentia*.

SITUATION OF THE ANTHER.

It has already been stated, that the Anther is generally situated upon the tops of the filaments; in some plants, however, they are fixed to the middle or sides of the filaments; in many plants, having no filaments, they adhere to the stigma of the pistilliferous flower; whilst in others, alike destitute of filaments, the anthers are

fixed to the receptacle, and in some they are situated upon the nectary.

COLOUR OF THE POLLEN.

The colours of the Pollen are various, but the most common are different shades of *yellow*, *red*, and *purple*.

PARTICLES OF THE POLLEN.

The polleniferous particles also assume various appearances: thus,

In the *Helianthus*, (sun flower,) they appear like prickly balls.

In the *Geranium sanguineum*, like perforated globes of fire.

In the *Mallows* they resemble wheels furnished with teeth.

In the *Ricinus communis*, or *Palma Christi*, they are shaped like grains of wheat.

In *Viola tricolor*, they are angulated.

In the *Indian Corn*, they are flat and smooth.

In *Borage*, like a thin leaf, rolled up.

In the *Narcissus*, reniform, or kidney-shaped.

In *Symphitum* or Comfrey, like double globules.

This may be carried on *ad infinitum*, but sufficient has been advanced to illustrate the subject,

THE PISTILLUM.

The *Pistillum* is the fourth part of Fructification enumerated by Linnæus, and defined by him as “an organ adhering to the fruit, for the reception of the pollen.” “*Viscus fructui adhærens pro Pollinis receptione.*”

The Pistillum, to which many have given the name of Pistil and Pointal, assumes the appearance of a column, or set of columns, and is commonly situated in the centre of the flower, within the stamens. When perfect, it consists of three parts, the *Germen*, the *Stylus*, and the *Stigma*.

A knowledge of the Pistil, as consisting of these collective organs, is of no less consequence in the study of Botany, than is a knowledge of the Stamens. In a physiological point of view, each set of these organs is entitled to an equal portion of our attention, since they are equally and conspicuously concerned in the business of perpetuating the species. The pollen of the Anthers would have been formed and secreted in vain, were there no Germen to receive and preserve it during the cold seasons of the year; for warmth is as necessary to its vitality, as space and nutriment are for its expansion. Linnæus has somewhat inconsistently, with other terms, called

* *Philosophia Botanica*, &c. page 53, sec. 86.

the Germen “a *Seed-bud*,” a Seed-bulb would be a more appropriate name, it being a receptacle furnished with a mucilaginous fluid in the form of globules, varying in shape, and by which the already vivified Pollen is sustained and forced on to sufficient maturity to withstand the effects of the common temperature of the common air.

This organ will be better understood by reversing the order in which it is usually subdivided, and letting it stand thus,

THE STIGMA, THE STYLE, AND THE GERMEN.

The Stigma is the summit of the Pistillum, which, by being in many cases of a greater diameter than the style, is capable of receiving a large quantity of the pollen; it may be said, with some modification, to resemble the upper part of a funnel; and since it is in all cases moistened with a clammy fluid, it is most admirably adapted to retain the pollen when deposited, and to assist its dilation.

The number of the stigmas is very different in different vegetables. Some have only one, some two, three, four, five, and even a larger number.

DIVISION OF THE STIGMA.

In respect to its division the stigma is *simplex*, *fissum*, *bifidum*, *trifidum*, &c., *partitum*, *bipartitum*, &c., *lobatum*, *bilobatum*, &c.

FIGURE OF THE STIGMA.

The figure of the stigma is either *capitatum*, *globosum*, *urceolatum*, *ovatum*, *obtusum*, *truncatum*, *oblique-depressum*, *emarginatum*, *planum*, *reniforme*, *orbiculatum*, *peltatum*, *coroniforme*, *cruciforme*, *stellatum*, *canaliculatum*, *concavum*, *umbilicatum*, *plicatum*, *radiatum*, *angulatum*, *striatum*, *plumosum*, *filiforme*, *capillare*, *convolutum*, *revolutum*, *flexum-sinistrorsum*, *flexum-dextrorsum*, *barbatum*, and *imberbe*.

PROPORTION OF THE STIGMA.

It is in this respect either *longitudine styli*, as long as the style, &c. &c. &c.*

EXPANSION OF THE STIGMA.

The stigma is either *Fimbriato-crispum*, curled or fringed.

Foliaceum, foliaceous; or like a leaf.

Cucullatum, cowled.

* All those terms have been before explained, either under the head of Nomenclature of Leaves, or other parts.

DURATION OF THE STIGMA.

The stigma is, in this respect,

Persistens, permanent; remaining until the fruit be mature. Or,

Marcescens, shrivelling; remaining, but becoming withered; as in the greater number of plants.

THE STYLUS.

The Stylus,* or style, is the middle portion of the pistil, and which, when existing, connects the stigma with the germe. In many plants the style is not present, and, by supposition, therefore, is not absolutely necessary. When present, the style, in a great number of plants, is most unequivocally tubular; that is, there is an open and uninterrupted cavity leading from the stigma to the germe.

In others, however, no such duct has been discovered, even when the style has been examined by a powerful magnifier; but it does not follow hence, that no such duct exists. It may be too small to fall under the cognizance of our senses at all, or it may be visible only at

* From *στυλος*, a column

a particular period; namely, when the stigma receives the pollen. It is quite certain that, after the pollen has been deposited upon or within the stigma, the germen is its destination, and we know that it arrives there.

The style, like most other organs, varies in respect to number in different plants; some having but one style, some two, three, &c.; whilst others are furnished with many. In general, the number of the styles is equal to that of the germes, each germe being furnished with its particular style. This is the structure of the Compound flowers, the Cone-bearing plants, the Rose, the Ranunculus, the Liriodendron, or Tulip-tree, and many others. To this general rule there are exceptions: there are vegetables which have more than one style to a single germe, or seed-bud. There are again other plants, such as the Asperifoliæ, and most of the Lip-flowers, which have a single style common to many germes: and in some the style, at its origin, is single, but soon branches out into as many ramifications as there are divisions, or cells, in the cavity of the germe. This structure is discovered in the plants of the two families of Geranium and Mallow, and many of their relations, principally belonging to the class Monadelphica.

PROPORTION OF THE STYLE.

The style may be,

Longissimus, very long; with respect to the stamens.

Brevissimus, very short.

Longitudine staminum; as long as the stamen.

Crassitie staminum; as thick as the stamen.

Crassus; thick with respect to the stamen.

Tenuis; slender.

DIVISIONS OF THE STYLE.

These are,

Simplex, simple; not divided.

Bifidus, bifid.

Trifidus, trifid.

Bipartitus, two parted, &c. &c.

FIGURE OF THE STYLE.

Teres, columnar;—*Cylindricus*, cylindrical;
—*Capillaris*, capillary;—*Clavatus*, club-shaped;
—*Subulatus*, subulate;—*Alatus*, winged;—
Tetragonus, four-cornered;—*Ensiformis*, ensi-
form;—*Villosus*, villous.

DIRECTION OF THE STYLE.

The style assumes most, if not all, the directions which have been noticed in treating of the filaments.*

SITUATION OF THE STYLE.

In the greater number of plants it is,

In *Apice germinis* placed on the top of the germe. In others it is

Ad latus germinis, placed at the side of the germe, that is, the styles, which are numerous, proceed from within the side of their corresponding germes.

This structure is observable in the Rose, the Raspberry, Strawberry, Cinquefoil, Tormentil, and other plants belonging to the order *Polygynia*, in the twelfth class, *Icosandria*.

DURATION OF THE STYLE.

It is either

Persistens, permanent; remaining until the fruit be ripe, as in the plants of the class *Tetradynamia*; or

Deciduus, deciduous; falling off with the other parts of the flower, as in the greater number of vegetables.

* See page 120, &c.

THE GERMEN.

This important organ now comes under consideration. It constitutes the lower part or base of the pistil, and supports the style and the stigma. It is the seed-bud,* furnished with a capacity to receive, and nutriment to evolve the future plant, which, in its embryo state, is contained in the pollen; and which, after it has been deposited on the stigma, is conveyed from thence by the style, if it be present. When that sub-organ is absent, the pollen is directly received by the germen from and through the stigma.

Linnaeus, in pursuing his favorite subject of the analogies which he deemed to subsist between animals and vegetables, seems here to have forgotten his own practical observations on the pollen; in which the embryo of the future plant, perfectly formed, is plainly developed.

In fact, neither he nor his followers seem to have been candid in treating of the economy of the interior of the Germen; and this appears to have arisen from a fear of shaking their favorite hypothesis as to the resemblance between the vegetable and animal creation. That this is nothing better than an hypothesis is shewn, first, by the organization of the pollen, as

* More properly *seed bulb*.

already described; and, secondly, by the fact that no microscopie observations have proved that the substance originally in the Germen to be such, as it must be, if Linnæus's theory be true. It is to be regretted that Linnæus so frequently indulged in the uses of terms which might, without any real injury to his favorite science, have been dispensed with. The ideas which they represent are in no respect essential to his system, but in truth have the effect of excreseencies and deformities; by introducing vague and fanciful analogies they detract from the severe truth and propriety by which it is in general characterized.

The general features of the Germe now claims our attention; it varies in respect to number in different plants: some plants have but one germe, some two, some three, whilst some have many more.

FIGURE OF THE GERME.

It is *Subrotundum, oblongum, ovatum, turbinatum, conicum, lineare, cordatum, obcordatum, globosum, fissum, bifidum, trifidum, partitum, bipartitum, angulatum, triangulare, didymum, compressum, acutum, rostratum, and subulatum.*

SURFACE OF THE GERME.

It may be either *Scabrum, villosum, or imbricatum.*

SITUATION OF THE GERME.

It is either *Superum*, superior; that is, included in the Corolla or the Calyx; or

Inferum, inferior, when placed beneath the corolla or calyx.

INSERTION OF THE GERME.

The various modes are thus named,
Sessile.

Pedicellatum, pedicelled, standing on a pedicle, or footstalk.

Setæ incidens, sitting on a bristle.

PROPORTION OF THE GERME.

Minimum, very small in proportion to the corolla.

Longitudine Stamina, as long as the stamens.

— *calycis*, as long as the calyx.

— *nectarii*, as long as the nectary.

THE PERICARPIUM.*

The *Pericarpium* or pericarp, is the fifth part of fructification enumerated by Linnæus, but it

* From the Greek word, περι, peri, around, and καρπος, karpos, the seed or fruit.

does not exist till a particular stage of the progress. The pistillum having received the farina of the anther in the manner before related, and the farina deposited, becoming enlarged, the organ at this period ceases to retain its former name (germen), and takes the appellation of Periearp.

The Periearp is consequently a most important organ, being designed for the purpose, as Ray says, of *guarding the seeds until they are ripe, and then committing them to the bosom of the earth, the air, or the waters.*

Some writers call this organ a seed-vessel, or seed-case; and both of these terms are appropriate and significant, but pericarp is more consonant to the prevailing language of botany.

Some plants are destitute of the periearp. This is the case in the Asperifolia, or rough-leaved plants, in the Verticellate plants, and in the compound flowers: in these families, the place of the periearp is supplied by the calyx, which encloses the seed and accompanies them to perfection.

Linnæus enumerates eight different species of pericarp, viz.:

The *Capsula*, *Siliqua*, *Legumen*, *Folliculis*, *Drupa*, *Pomum*, *Bacca*, and *Strobilus*.

The *Capsula*, or Capsule, is a membranous hollow pericarp, which spontaneously opens or splits in some determinate manner, differing in different vegetables.

In respect to its figure and substance, the capsule is as varied as any portion of the plant; and in splitting or opening, it is divided externally into one or more pieces, to which Linnæus has given the name of *valvæ* or valves. These valves form outer coats, shells, or covering of a capsule, or any other kind of pericarp, by the opening of which the seeds, when ripe, escape. According to the number of its valves, the capsule is *bivalvis*, two-valved, *trivalvis*, &c. &c.

The internal divisions of the capsule are denominated *Loculamenta*,* or cells; these are the chambers appropriated for the reception of the seeds. According to the number of these cells, the capsule is *unilocularis*, one celled, *bilocularis*, two celled, &c.

The partitions by which the capsule is thus divided into cells, are called by Linnæus *dessepimenta*. This membranous wall or partition is of various forms, and radiates from a column or pillar in the centre of the capsule, called

* From *loculamentum*, signifying a case, a drawer, a bag, &c.

columella; this organ takes its rise from the receptacle, and has the seed fixed to it all round.

Representations of different kinds of capsules will be found at Plates 3, 6, 10, 11, 12, and in the frontispiece.

The *Siliqua*, *Silique*, or *pod*, is a two-valved pericarp, having the seed fixed along both sutures.

The proper silique is bilocular, or two-celled, being furnished with a partition which runs the whole length of the pericarp. It is to be observed, however, that some pericarps which have the same form, take the name of *Siliqua*, although they have no partition, and, of course, are unilocular or one-celled, as in *Fumitory* (*Fumaria*), and *Celandine*, or *Chelidonium*.

Linnaeus, as well as Ray, has distinguished the silique from the *silicula*, or *silicle*. These two pericarps do not essentially differ from each other: they vary only in form and size. The first-mentioned species is much longer than it is broad: examples of this kind of pericarp will be found in the following vegetables, viz.: mustard, radish, wall-flower (*Cheiranthus*), watercresses, *Bignonia longissima*, and many others. The *silicula* or *silicle* is almost round, or, at least, makes a much nearer approach to the orbicular form, as in the *Lunaria* (satin-flower), in *Alyssum*

(mad-wort), *Thlaspi* (shepherd's purse), *Iberis* (candy-tuft), and others.

This difference in the form and shape of the silique and silicle, is assumed by Linnæus as the foundation of the two orders into which he has distributed the plants of the 15th class of his system.

In regard to the figure of the pericarp, (whether it be silique or silicle,) it is

Compressa, compressed.

Torosa, torose, swelling out into knobs.

Torulosa, swelling as above, but in a smaller degree.

Articulata, jointed, intercepted with tight joints.

The *Legumen*, or legume, is a pericarp of two valves, in which the seeds are fixed along one of the sutures only. By this circumstance, it differs from the last-mentioned species of pericarp, in which we have seen the seeds are fixed to both sutures.

The English word for the legume, is pod; and the pericarp of the pea, which is a true legume, is still called a peas-pod.

Both in figure and substance the legume partakes of the greatest variety; and the same

diversities of character which, in these respects, apply to other organs, are applicable to this.

This remark is applicable to proportion and structure.

Plants which are furnished with a legume, as a pericarp, are denominated *Leguminosæ*, or Leguminous plants.

The *Folliculus*,* or follicle, is a one-valved pericarp, which opens longitudinally only on one side, and has its seed loose within it, that is, not bound to the suture. We have examples of this kind of pericarp in the genera *Nerium*, *Strapelia*, *Cynanchum*, *Periploca*, *Apocynum*, *Asclepias*, *Embothrium*, *Vinea* (Periwinkle), and others.

The *Drupa*, or drupe, is a species of pericarp which is destitute of valves, and contains a nut or stone, within which there is a kernel. This kind of pericarp occurs chiefly in moist and succulent fruits, such as the plum, cherry, apricot, peach, and olive; but sometimes it is dry, as in the almond. To these two species of drupa, have been given the names of *Succulenta*, succulent or juicy, containing a fluid; and *Sicca*, dry or juiceless.

The term *drupa* is sanctioned by classical

* Which signifies a little bag, a husk of wheat, or other grain.

authority. It is employed by Pliny, who uses the word for the fruit of the olive.* It is also equivalent to the term *Prunus*, as employed by other botanists. The nut or stone, which in the drupe, is surrounded by the soft and pulpy substance, is a kind of woody cup, which commonly contains a single kernel, called *Nucleus*; and the hard shell which envelopes the kernel is denominated the *Putamen*.

The *Pomum*, or Pome, is a pulpy pericarp, without valves, but containing a membranous capsule, with a number of cells or cavities, for the lodgement of the seeds. This species of pericarp has no external opening or valve. At the end, opposite to the peduncle or footstalk supporting the pome, there is frequently a small cavity, to which horticulturists have given the name of the eye of the fruit.

The apple, pear, quince, gourd, cucumber, melon, and many others, furnish examples of this kind of pericarp.

The *Pomum* exhibits as many varieties of figure as the foregoing subdivisions of the *Pericarpium*; perhaps even more, for the form of fruits is immensely affected by climate and soil.

* Lib. 15, chap. 7.

With respect to its cells, this species of PERICARP is *triloculare*, three-celled, &c. &c.

The *Bacca*, or *Berry*, is a succulent or pulpy Pericarp, without valves, and containing seed which have no covering. The seeds, in this species of pericarp, are sometimes dispersed promiscuously through the pulpy substance, as in the *water-lily*; but they are more generally placed upon receptacles, or footstalks, within the pulp; as in the *Currant*, *Gooseberry*, *Raspberry*, *Hydrastis*, and many others.

The berry assumes a considerable variety of forms; and, according to the number of seeds which it contains, it is called

Monosperma, one-seeded.

Disperma, two ditto.

Polysperma, many ditto.

The berry is said to be proper or improper: proper, if formed of the pericarp or seed vessel; improper, if formed of any other part of the fructification. Thus, in the Mulberry, Rose, Blite (*Blitum*), and the Myrtle-leaved Sumach (*Rhus Coriaria*), the large and succulent calyx becomes a berry. In the Strawberry and Cashew-nut (*Anacardium*), the berry is formed from the receptacle: in the Raspberry and Adonis, it is

formed of a seed; in the Marvel of Peru (*Mirabilis*), it is formed of the nectary, and in the Garden Burnet (*Poterium Sanguisorba*), it is formed of the tube of the corolla, which hardens and shuts for the purpose.

Certain fruits, such as Mulberry, Raspberry, Blackberry, and many others, which are generally spoken of as simple berries, may, with more propriety, be denominated compound and spurious berries: for each of the component parts, which are called *acini*, or *granules*, may, very probably, be considered as a distinct berry, containing a single seed immersed in a pulpy substance.

The berry does not spontaneously gape or burst, as do the first four species of pericarp, which have been mentioned.

The *Strobilus*,* or Strobile, is the last species of pericarp enumerated by Linnæus; he defines it to be a pericarp formed from an ament, by the induration of the scales. This is the definition given in the *Termini Botanici*.

In the *Delineatio Plantæ* it is thus expressed: "*Strobilus imbricatus amenti coarctati*." That is, the strobile is made up of scales that are imbricated, or lie over each other, from an ament

* *Strobilus* signifies in Latin a Pine-tree, Pine-apple, an Artichoke; but it also signifies a whirlwind.

contracted or squeezed together; in this state of maturity, Dr. Martyn observes, "This term includes not only the cone of former writers, but also the fruits which recede considerably in structure from that sort of pericarp; as that of *Magnolia*, *Tulip-tree* (*Liriodendron*), and others:" but it must be evident that it is improper to translate *strobilus* by cone, since it assumes a variety of forms in different vegetables; but, from what has been previously said in relation to the forms of the numerous organs already considered, it is unnecessary here to advert to them particularly.

THE SEED.

The *Seed* is the sixth part, and it is the end and aim, of the fructification; it is to its production and security that all the other organs are subordinate.

It is, in fact, the pollen at maturity, which now only requires the fertilizing qualities of the earth, air, and water, to develop its capabilities and expand it into the perfect plant.

The number of the seeds is a variable circumstance in different vegetables. Some plants have only a single seed in each pericarp; some have two, others three, &c. &c.

In regard to the figure, size, surface, colour, consistence, and situation, what has already been advanced on those heads will be amply sufficient.

Seeds are divided into five parts:

The *Pappus*, *Coma*, *Cauda*, *Ala*, and *Crista*.

The *Pappus*, or, as the French term it, the *Aigrette*, is a sort of feathery crown, with which many seeds, especially those of the compound flowers, are furnished, evidently intended to facilitate the great business of their dissemination or dispersion.

The *Coma*, is very nearly allied to the pappus, for, like it, it is formed of a villous substance, which is placed upon the vertex of the seed, and collected into a bundle. According to Gærtner, it differs from a pappus, because in the coma the villous or feathery substance derives its origin from the shell of the seed, and not from the proper calyx of the flower; and because all the connate seeds are furnished with a true pericarp, as in Willow-herb (*Epilobium*), and others.

The *Cauda*, or Tail, resembles a slender stipe, proceeding from the vertex of the seed, having a feathery appearance from the base to the apex, and being in all cases longer than the seed.

The *Ala*, or wing, is a broad, flexible, and membranous expansion, fixed to the vertex, back, or sides of certain fruits and seeds, and

thus facilitating their dispersion. When it occupies the vertex and back, it is especially denominated a wing; but when it surrounds the sides, it is called a margin (*margo*).

Seeds which are furnished with wings, are called *unialata*, one-winged, two-winged, &c. &c. A membranous margin is not uncommon in seeds, and it is found in almost every form and shape.

The *Crista*, or crest, is very nearly related to the wing, but it is narrower, less flexible, and formed of a coriaceous or cork-like substance, and always placed at the back of fruits; according to situation and appearance, it has received various names.

Besides the seed, properly so called, two other kinds are referred to this general head by Linnæus, viz.: the *Nux* and the *Propago*.

The *Nux*, or nut, is a seed covered with a shell; the nut has an affinity, on the one hand, with the capsule, and on the other hand, with the drupe: from the capsule, it differs in the total want of valves, and, in the base, often having a scraped or filed appearance for some distance. From the drupe, it differs generally in the nakedness of the shell; or, if there be a rind, in the incomplete opening at its apex. Nuts are more

generally supplied with an involuere than any other species of pericarps; as in chesnut, beech, yew, juniper, hazel, oak,* and others.

In regard to the character of the integuments: These, as to consistence and internal fabric, are very various.

The last general feature of the nut is, that it has no spontaneous opening before the germination of the seed; nor does the number of the valves, in any instance yet known, exceed two.

Propago is the name of the seed of the Mosses, upon which there exist some most conflicting opinions, but none of them appear to have much tendency to advance the science of botany; and if the term *Propago* were entirely expunged, it is probable that no inconvenience would result.

THE RECEPTACULUM.

The Receptaculum,† or receptacle, is the seventh and last part of fructification spoken of by Linnæus: he defines it “the base by which the other parts of the fructification are connected.” To this part of the fructification Boerhaave

The cup of the Acorn is called by late writers *cupula*.

† From *Recipio*, to receive.

gave the name of *Placenta*, and Vaillant that of *Thalamus*.

The following species of receptacle are enumerated by Linnæus, viz.:

Receptaculum proprium.

———— *commune.*

———— *umbella.*

———— *cyma.*

———— *spadix*; but

the last three will be treated of under a separate head, viz., that of *enflorescence*, or the mode of flowering; and the first two only considered in this place as receptacles.

The *Receptaculum proprium* is a proper or peculiar receptacle, appertaining to one fructification only. Of this kind is the receptacle of all the simple flowers. This species of receptacle has received different names, from the particular parts which it supports and connects: thus,

The *Receptaculum fructificationis*, or receptacle of the fructification, is common both to the flower and the fruit; or, in other words, embraces the corolla and the germe.

The *Receptaculum floris*, or receptacle of the flower, is the receptacle supporting the parts of the flower only. In these cases, the germen,

or seed-bud,* which is placed below the receptacle of the flower, has a proper base of its own.

The *Receptaculum fructus* is the receptacle of the fruit. Examples of this are seen in the *Gaura*, *Oenothera*, and others.

The *receptacle of the seed* is the base to which the seeds adhere; and this species of receptacle is denominated by Boerhaave, and some other botanists, *Placenta*, because it is the common receptacle of the vessels through which nourishment is conveyed to the seeds.

The *Receptaculum commune*, or common receptacle, connects several florets or distinct fructifications, so that, if one of them be removed, irregularity is occasioned. This receptacle is subject to great variety, both as to colour, surface, consistency, and size.

In drawing the generic characters of plants, the receptacle is a* part which ought always to be attended to. It is seldom omitted by Linnæus in his *Genera Plantarum*, and in discriminating the genera of the class Syngenesia, it is a character of the greatest importance.

The next branch of our subject relates to vegetable inflorescence.

* Properly seed-bulb.

THE INFLORESCENTIA.

By the term Inflorescentia, Linnæus means the various modes in which flowers are fastened to the plant, by means of the peduncle. This is what Ludwig, and many other botanists, denominated *Modus Florendi*. These modes are thirteen in number, viz. *Spadix*, *Cyma*, *Umbella*, *Spica*, *Amentum*, *Strobilus*, *Corymbus*, *Racemus*, *Panicula*, *Thyrsus*, *Fasciculus*, *Capitulum*, and *Verticellus*.

The first three of these have already been mentioned under the head of receptacle: but the term receptacle, as applied to these, is most certainly a misnomer, and therefore they claim to be somewhat more particularly noticed in this place.

The *Spadix* proceeds from that species of calyx which is called Spatha, or Spathe. It is either branched (*ramosus*), as in the palms; or simple (*simplex*), as in *Arum maculatum*, and others.

The simple or unbranched *Spadix* displays some variety. Thus, in *Calla*, *Dracontium*, *Pothos*, and *Golden club*, the florets cover it on all sides. In *Arum maculatum*, and others, they are disposed on the lower parts exclusively; and in *Zostera marina* (*Grass-wrack*), on one side only.

According to the number of florets which it supports, the Spadix is called Uniflorus, one-flowered; Biflorus, two-flowered; and multiflorus, many flowered.

The *Cyma*,* or cyme: this is a compound flower, composed of several florets sitting on a receptacle, producing all the primary peduncles from the same point, but having the partial peduncles scattered or irregular; some fastigiate, and others forming a flat surface at top. We have instances of the Cyme in the wild Guelder rose (*Viburnum opulus*), in common Elder (*Sambucus nigra*), in *Ophiorhiza*, and various species of Cornel or Dogwood, &c.

The Cyma is sometimes furnished with bractes, and sometimes not. When flowers are disposed in a Cyme, they are called *Cymosus flos*, or Cymose flowers.

The *Umbella*, or umbel, is an inflorescence stretched out upon filiform proportioned peduncles from the same centre. This organ has been treated of under the head of Involucrum or Involucre. Several circumstances, however, respecting the Umbel, are worthy of being particularly noticed here.

The Umbel may be

Simplex, simple; or undivided; as in Ginseng

Cyma signifies a sprout or tender shoot.

(*Panax quinquefolium*), *Hydrocotyle* (Whiterot), *Bupleurum tenuissimum* (Hare's ear), and *Caucalis nodosa* (Knotted parsley.)

Composita, compound; each peduncle bearing another little Umbel, or Umbellule. In this case, the first or larger set of rays constitute the universal Umbel (*Umbella universalis*); while the second or subordinate set of peduncles constitute the partial Umbel (*Umbella partialis*.)

Prolifera, proliferous, super-decompound; or more than decompound.

The *Umbella* may be also *concava*, concave; *fastigiata*, fastigiate, or rising gradually like the roof of a house; *convexa*, convex; *erecta*, erect; *nutans*, nodding; *terminalis*, terminal; *axillaris*, axillary; and *oppositifolia*, oppositifolious.

Flowers which grow in the manner of an Umbel, are called *Umbellati*, umbellate, or umbelled flowers; and by many writers they are denominated Umbelliferæ, Umbelliferous, and Ferulaeæ.

The *Spica*, or spike, is a species of inflorescence in which sessile flowers, or flowers without peduncles, are scatteringly alternated on a common simple peduncle; examples of this mode of inflorescence are seen in the ears of Wheat, Rye, Barley, and many other grasses; and also in *Lavendula* (Lavender), *Verbascum*, Mullein, Agrimony, and many other plants.

The flowers of a Spike are situated immediately upon the stalk, without any partial peduncles or footstalks, as has already been observed. This circumstance distinguishes this mode of inflorescence from the raceme. It often happens, however, that they are in a Spike; and, along with the Sessile flowers, we find others that are pedunculated, as in some species of *Cyperus*, &c.

The *Spicula*, spicule, or spikelet, is a partial spike, or a subdivision of a true spike; this occurs in some of the grasses, as Darnel, &c.; the filiform receptacle, which connects the florets longitudinally into a spike, is denominated *Rachis*.

Of the *Ament* and *Strobilus* particular and sufficient notice has already been taken when treating of the various species of Calyx,* and of the Pericarp;† but it is necessary to observe, in this place, that the Ament is more properly referrible to the head of Inflorescence than that of Calyx.

The *Corymbus*, or as Dr. Martyn calls it, Corymb, is said by Linnæus to be “made up of a Spike, whilst each flower is furnished with its proper footstalk, or peduncle, in an elevated proportioned situation.” This is not very intelligible, and hence different botanists have given

* See page 84.

† See page 147.

different interpretations of his words. In this species of Inflorescence, the smaller or partial flower-stalks are produced along the common stalk, on both sides; and although they are of unequal lengths, they rise to the same height, so as to form at the top a flat and even surface. Examples of this mode of flowering is seen in the following: *Spiraea opulifolia* (Nine bark or Seven bark), *Cochlearia officinalis* (Scurvy-grass), *Myosoton sativum* (Gold of pleasure), and many other tetradynamous plants.

The *Corymb* differs from the *Umbel* in this circumstance, that in the former the numerous partial footstalks take their origin from different parts of the common stalk; whilst in the latter, as we have already seen, all the peduncles proceed from a common centre. The *Corymb*, it has been mentioned, is a mean between the *Umbel* and the *Raceme*.* Like them, its flowers are furnished with their proper footstalks, which rise gradually from the bottom to the top, as do those of the *Raceme*, and are extended to the same height, as are those of the *Umbel*.

Racemus,† *Raceme*, or *Cluster*, is the name of the eighth species of Inflorescence, enumerated

* As the *Cyme* is between the *Umbel* and the *Corymb*.

† *Racemus*, in Latin, signifies a cluster, or bunch of Grapes, &c.

by Linnæus. It is a species of flowering in which the flowers, placed along a common footstalk, are furnished with short proper footstalks that proceed as lateral branches from the common stalk. This member is closely allied to the Spike, for in both the flowers are placed along a common footstalk, or receptacle; but in the Spike, as we have seen, the flowers are sessile; whereas, in the Raceme, they are pedunculated. In general, too, the flowers are less abundant in the Spike than in the Raceme; but to this there are many exceptions.

This organ is *simplex*, simple; or *compositus*, compound; *Unilateralis*, one-sided, having all the flowers growing on one side of the peduncle; as in *Pyrola secunda* (serrated winter-green); *Secunda*, all bent or directed in the same way; *Pedatus*, pedate; *Conjugatus*, conjugate; *Erectus*, erect; *Laxus*, loose; *Dependens*, hanging down and pointing to the ground; *Nudus*, naked; *Foliatus*, leafy.

Good and familiar examples of the Raceme are found in the Vine, Currant, and different species of Prunus or Plum, such as the common Wild-cherry, (*Prunus virginiana*), and the *Prunus padus* (Bird-cherry,) &c.

The *Panicula*, or Panicle, is the name of the ninth species of inflorescence. In this the flowers or fruits are scattered on peduncles, variously

subdivided. In other words, it is a kind of branching or diffused spike, composed of a number of small spikes, which are fixed along a common receptacle, or footstalk. Instances of this form of inflorescence is seen in Oats, Panicgrass, and many other plants.

The following are the principal species or varieties of panicula enumerated by botanists:

Panicula congesta, a heaped panicle, having a great abundance of flowers.

— *densa*, a dense or close panicle, one on which the flowers are both close and abundant.

— *spicata*, a spiked panicle, approaching in form to a spike, as in many grasses.

— *contracta*, a contracted panicle, and closer in a great degree than the foregoing.

— *coarctata*, a squeezed panicle, having the peduncles extremely near to each other.

— *patens*, a spreading panicle, having the peduncles spreading out so as to form an acute angle with the stem.

— *diffusa*, a diffused panicle, having the peduncles spreading out more and more irregularly.

— *divaricata*, a divaricating panicle, spreading out still more; at an obtuse angle with the stem.

The *Thyrus*, or Thyrese, is a mode of inflorescence very closely allied to the panicle, being, in fact, a panicle contracted into an ovate, or egg-shaped form. In the thyrese, the middle footstalks, which are the longest, extend horizontally, whilst the upper and lower ones are shorter and rise up vertically. We have instances of this beautiful species of inflorescence in Lilac (*Syringa Vulgaris*), in Butter-bur (*Tussilago Petasites*), and other plants.

The *Fasciculus*,* or fascicle, is a species of inflorescence in which several upright, parallel, fastigate, approximating flowers are collected together, as in Sweet William (*Dianthus barbatus*), and others.

The *Capitulum*,† or head, is that species in which several flowers form a kind of ball, or head, at the extremity or summits of the footstalk, as in *Globe amaranthus*, *Gomphrena globosa* (Bachelor's buttons), and some species of Trefoil (*Trifolium*), and wild thyme (*Thymus serpyllum*).

The *Capitulum* is either

Globosum, globular or round, as in *Gomphrena globosa*.

* Diminutive, (from *fascis*, a bundle.)

† *Capitulum*, in Latin, signifies a little head, the top or chapiter of a pillar, &c.

Dimidiatum, halved, hemispherical, or resembling half a head, as in *Lippia hemisphærica*.

Ovatum, ovate, as in *Lippia ovata*.

Hispidum, hispid or bristly, as in *Clinopodium vulgare* (Field-basil).

Foliosum, leafy, intermixed with leaves.

Nudum, naked, having no leaves.

Pedunculatum, peduncled, furnished with little footstalks, as in *Teucrium pumilum*.

Pyramidatum, pyramidal, shaped like a pyramid, as in *Lippia Americana*.

Subrotundum, subrotund, or roundish, as in *Selago fruticosa*.

The *Verticillus*,* is the thirteenth and last species of inflorescence noticed by Linnæus. It is called in many cases the whirl or whorl.† It is made up of many subsessile flowers, which surround the stem, in the form of a ring.

Examples of this inflorescence is seen in the *Mentha pulegium* (Pennyroyal), *Marrubium vulgare* (Horehound), *Callicarpa Americana*, and other plants.

The *Verticillus* may be

Sessilis, sessile, without peduncles.

* From *verto*, to turn.

† It is commonly written whorl: but whirl must be the most proper, since, as Dr. Martyn says, "It must be derived from the verb to whirl, and which signifies to turn rapidly," an expression indicative of its appearance.

Pedunculatus, peduncled, with peduncles.

Nudus, naked, without involucre, bractæ, or bristle.

Bracteatus, bracted, furnished with bractes.

Involucratus, involucred, furnished with an involucre.

Confertus, crowded.

Distans, distant.

Remotus, remote.

This subject cannot be properly closed without observing that, in some plants, the flowers grow upon the leaves: this is the case in the genus *Ruscus*, or Butcher's broom. Linnæus does not recognize this as a species of inflorescence, (but such it seems entitled to be called;) and yet he calls it "leaf-bearing."

A similar mode of flowering occurs in *Osyris Japonica*, a native of Japan. Professor Thunberg, who observed it in this vegetable, speaks of it as a rare species of structure in the vegetable world.

PART III.

INTRODUCTORY REMARKS ON SYSTEM, OR
CLASSIFICATION.

A really natural arrangement of plants, by which is meant an arrangement that should bring together, under particular and positive Classes or Orders, plants agreeing not only in their structure and appearance, but also in their properties; is, in all human probability, that which will never be accomplished.

A belief, however, in this position, ought not to discourage or deter us from striving to render this science as simple as possible; at the same time, the method adopted should approach to the economy of nature as nearly as circumstances will permit.

Among those who have aspired to lead the opinions of mankind in Botanical science, Linnæus has gained a reputation of the highest order; and for a long period, his authority was paramount, and his system followed almost implicitly. It has most undoubtedly great merit, it is pro-

found; but that it is deformed by innumerable blemishes is equally true. It has been one object of this work to give a view of this admired system, divested of one of the most prominent and to our sex the most repulsive of those blemishes which has operated very prejudicially in discouraging the cultivation of a most beautiful, and when properly investigated, a most unexceptionable and improving, study.

According to this celebrated system, (which, with the modifications that have been hazarded,) the reader will find all known plants to be distributed into CLASSES, ORDER, GENERA, SPECIES, and VARIETIES. The advantages of this arrangement are well described by Professor Lindley, who says, "*To acquire the power of referring plants to their places in this system, nothing more is requisite than just so much knowledge of structure as will enable the student to distinguish the one set of organs from the other, to count their number, and to determine to which of the modifications of arrangement they are to be referred. Hence,*" continues the Professor, "*the great popularity acquired by the Linnæan system, and which is at first sight so simple and precise as to leave nothing to be wished for.*"

SYSTEM, OR CLASSIFICATION.

The CLASSES are twenty-four in number, and are formed from the *Number*, the *Place of Insertion*, the *Proportion*, the *Connexion*, the *Disposition*, or the *Absence* of the STAMENS.

The ORDERS, or secondary divisions, are much more numerous : in the first thirteen classes they are founded upon the number of the *styles*, but in the succeeding classes they are subdivided under other circumstances, and which can be more advantageously explained hereafter, under the head of “*Character of Classes, with their orders, &c.*”

It is necessary here to observe that the words *Andria* and *Gynia*, which will now be frequently before us, are derived from the Greek words *Ανρ* and *γυνη*, man and woman; these, in their respective stations, joined to the Greek numerals, give the definitions by which we recognize the first thirteen *Classes*, as well as the *Orders* into which they are subdivided.

The Greek Numerals.

These being so lavishly used in all botanical works, it becomes necessary to be properly acquainted with them, as well as with their derivation; and it is with this view they are added:

1	Mon	from	monos	one
2	Di	"	dis	two
3	Tri	"	treis	three
4	Tetr	"	tessares	four
5	Pent	"	pente	five
6	Hex	"	ex	six
7	Hept	"	epta	seven
8	Oet	"	octo	eight
9	Enne	"	ennea	nine
10	Dec	"	deka	ten
11	Dodec	"	dodeka	eleven
12	Icos	"	ikosi	twenty
13	Poly	"	polus	many.

It has been seen that Linnæus divided his twenty-four Classes with reference to various particulars. These must now be adverted to, they are nine in number, and are derived as follows:

- 1 As to number of stamens, lengths being equal.
- 2 As to mode of insertion.
- 3 As to proportion.

- 4 As to connexion, or an union of filaments.
- 5 O an union of anthers.
- 6 O disposition, or the place from whence the stamens issue.
- 7 On the separation of stamens and pistils.
- 8 On (what is termed) Polygamy, and
- 9 On concealment.

I. AS TO NUMBER OF STAMENS. LENGTH EQUAL.

<i>No. of Stamens.</i>		<i>Class.</i>	<i>Definition.</i>
1	} Indicates {	1	Mon-andria.
2		2	Di-andria.
3		3	Tri-andria.
4		4	Tetr-andria.
5		5	Pent-andria.
6		6	Hex-andria.
7		7	Hept-andria.
8		8	Oct-andria.
9		9	Enne-andria.
10		10	Dec-andria.
12 to 19		11	Dodec-andria.

II. AS TO MODE OF INSERTION.

<i>No. of Stamens.</i>	<i>Inserted.</i>		<i>Class.</i>	<i>Definition.</i>
20, or more.	On the calyx or } Corolla.	} Indicates {	12	Icos-andria.
20, or more.	On the receptacle.		13	Poly-andria.

III. AS TO PROPORTION.

<i>No. of Stamens.</i>		<i>Class.</i>	<i>Definition.</i>
2 long, 2 short.	} Indicates {	14	Di-dynamia.
4 do. 2 do.		15	Tetra-dynamia.

IV. AS TO CONNEXION OR UNION OF FILAMENTS.

<i>Nature of the Union.</i>		<i>Class.</i>	<i>Definition.</i>
The Filaments of stamina being united at the bottom into <i>one</i> body, }	Indicates {	16	Mona-delphia.
The Filaments of stamina being united at the bottom into <i>two</i> bodies. }		17	Dia-delphia.
The Filaments of stamina being united at the bottom into <i>three or more</i> bodies. }		18	Polya-delphia.

V. ON UNION OF ANTHERS.

<i>Nature of the Union.</i>		<i>Class.</i>	<i>Definition.</i>
When <i>five</i> anthers are united and seated in a tube, it }	Indicates {	19	Syn-genesia.

VI. ON DISPOSITION, OR PLACE FROM WHENCE THE STAMENS ISSUE.

<i>Nature of the Position.</i>		<i>Class.</i>	<i>Definition.</i>
When the stamens grow out of the <i>pistil</i> , or from an elongated receptacle, it }	Indicates {	20	Gyn-andria.

VII. ON THE SEPARATION OF STAMENS AND PISTILS.

<i>Nature of the Separation.</i>		<i>Class.</i>	<i>Definition.</i>
When stamens and pistils are in separate corollas, but yet upon the same plant, it }	Indicates {	21	Mon-œcia.
When stamens and pistils are not only in separate corollas, but are also upon <i>different</i> plants, it }		22	Di-œcia.

VIII. ON WHAT LINNÆUS TERMS POLYGAMY.

<i>Character.</i>	<i>Class.</i>	<i>Definition.</i>
When Bisexual and Unisexual flowers are upon the same plant, or on different plants of the same species, that is, flowers which have both stamens and pistils, the latter of which are in some cases separated from the former, and in others united either on the same plant or on two or three different ones, in such cases	Indicates 23	Poly-gamia.

IX. ON CONCEALMENT.

<i>Circumstance.</i>	<i>Class.</i>	<i>Definition.</i>
If the stamens and pistils being invisible to unassisted vision, and so indistinctly discovered by the microscope as to prevent the plants being referred to any of the foregoing classes, it	Indicates 24	Crypto-gamia.

CHARACTER OF THE CLASSES, WITH THE ORIGIN OF THEIR ORDERS.

CLASS I.

MONANDRIA—*One Stamen.*

THIS class is subdivided into two orders, viz. Monogynia and Digynia. These orders, (up to the 13th inclusive) as has already been intimated, are founded upon the number of the styles possessed by the plant; those of the first order have only one style, those of the second have two, &c.*

This class (Class I.) has no very high claim to the character of a natural class, since it brings together vegetables very dissimilar in their properties and appearance. It however contains a fine order of plants very nearly allied to each other, comprehending the *Renealmia*, *Amomum*, *Curcuma*, *Thalia*, *Maranta*, *Myrosma*, *Kæmp-*

* See recapitulation of classes with their orders.

feria, *Canna*, *Alpinia*, and *Costus*; the majority of which are aromatic. For an illustration of the class, see Plate 3, fig. 1, *Canna glauca*.

CLASS II.

DIANDRIA—*Two Stamens*.

This class is subdivided into three orders, viz. *Monogynia*, having one style; *Digynia*, having two styles; and *Trigynia*, having three styles.

This, though not a natural class, embraces numerous plants which are considerably allied to each other; such as the *Olea*, *Chionanthus*, *Ligustrum*, *Syringa*, &c.; and also a number of plants, with ringent flowers and naked seeds: such as *Monarda*, *Rosmarinus*, *Salvia*, and others. For an illustration of this class, see Plate 4.

CLASS III.

TRIANDRIA—*Three Stamens*.

This is subdivided also into three orders, viz. *Monogynia*, *Digynia*, and *Trigynia*.* This may

* For explanation, see orders of Class II.

be considered a natural class, though the claim of the first order is, in this respect, inferior to that of the second.

In a medicinal point of view, the class *Triandria* is much less important to mankind than several of the other classes of the system. Nevertheless, it contains some useful articles of the *Materia Medica*, such as the *Valerian*, *Saffron*, different species of the *Iris*, or *Flag*, and the *Tamarind*. For an illustration of this class, see Plate 5, fig. 1.

CLASS IV.

TETRANDRIA—*Four Stamens*.

This class contains androgynous flowers, which are furnished with four stamens, all of an uniform length. It is subdivided into three orders, viz. *Monogynia*,* *Digynia*,† and *Tetragynia*.‡

It has a strong claim to the epithet—natural, having, in its several orders, plants so arranged, not only according to the system of Jussieu, but to the attempted *natural* classification of Linnæus himself. To this class also is attached both a *medicinal* and *commercial* importance, contain-

* Having one style.

† Having two styles.

‡ Having four styles.

ing, as it does, the *Rubia tinctorum*, (common madder.) Several species of *Cornus*; Some species of *Ilex* (Holly), particularly the *Ilex vomitoria*; and the *Cuscuta Americana* (American Dodder), which is extensively employed to dye a yellow colour.

For an illustration of this class, see Plate 5, fig. 2.

CLASS V.

PENTANDRIA—*Five Stamens.*

Its orders are six in number, viz. *Monogynia*,* *Digynia*,† *Trigynia*,‡ *Tetragynia*,§ *Pentagynia*,|| and *Polygynia*.¶

Of a class so extensive it is impossible to treat adequately within the small space which can be spared to the subject in an elementary work; it must, therefore, suffice to state, that the majority of the plants of this class are incorporated into every natural classification yet published or attempted, and that many of them are of the highest value to mankind; such as *Menyanthes*, *Spigelia*, different species of *Convolvulus*,

* Having one style.

† Ditto two styles.

‡ Ditto three ditto.

§ Having four styles.

|| Ditto five ditto.

¶ Ditto many ditto.

Datura Stramonium (Jamestown-weed), *Hyoscyamus* (Henbane), *Nicotiana* (Tobacco), *Chironia* (Centaury), *Solanum* (Nightshade), *Atropa*, *Ignatia amara* (St. Ignatia's bean), *Cinchona officinalis* (Peruvian bark, &c.) *Psychotria emetica* (Ipecacuanha), *Triosteum perfoliatum*, *Gentiana lutea*, *Heuchera Americana* (Alum root), *Conium maculatum* (Hemlock), *Ferula assafœtida*, some species of *Rhus* or *Sumach*, and many others of the most important articles in the *Materia Medica*. In fact, for the purposes of medicine, this is the most important class in the Linnæan system; the Poppy, however, which furnishes us with opium, belongs to another class.

Nature seems to have been fond of introducing into her most active and deleterious families of plants, species of individuals inactive and innoxious; and, on the other hand, into her most inert and most innocent families, species and individuals possessed of active and poisonous qualities. Without entering further upon the consideration of this subject, it may be observed, that no assemblage of vegetables, however natural the arrangement may be supposed, can be shewn to possess one uniform assemblage of like properties.

For illustrations of this class, see the whole of Frontispiece.

CLASS VI.

HEXANDRIA—*Six Stamens.*

In this class the stamens are all of one uniform length; or, at least, there is no determinate inequality in their lengths. It is subdivided into five orders, viz. *Monogynia*, *Digynia*, *Trigynia*, *Tetragynia*, and *Polygynia*.*

It may, with safety, be characterized as one of the most beautiful in the Linuæan system; and, in the scale of utility, it stands above several others; besides which, it has no inconsiderable claim to the character of a natural class.

To the *Materia Medica* it contributes many useful productions. Among them are different species of *Allium*, particularly the *Allium sativum* (Garlic), and the *Allium porrum* (Leek), which, though extensively employed as articles of diet, are also unquestionably possessed of great medicinal qualities; different species of the *Aloe*, (from which the *Aloes* of the druggist's shops is the inspissated juice;) and the *Scilla maritima* (the bulb or root of which is that important diuretic, the Squill.) To this class

* For explanations, see orders of the preceding class.

also belongs that important plant, the *Oryza sativa* (Rice.)

For an illustration of this class, see Plate 6, fig. 1.

CLASS VII.

HEPTANDRIA—*Seven Stamens.*

This class, the most inconsiderable of the twenty-four, is subdivided into four orders, viz. *Monogynia*, *Digynia*, *Tetragynia*, and *Heptagynia*.*

The genus *Septas*, a very singular one, belongs to the last order. The calyx of this plant consists of seven parts; there are seven petals, seven germes, and seven capsules! Only one species of this genus is known, the *Septas capensis*, a native of the Cape of Good Hope.

This class has a very slender claim to the character of a natural one; and the vegetables contained within it have little claim to notice, on the ground of accredited usefulness.

For an illustration of this class, see Plate 6, fig. 2.

- * Monogynia having one style.
 Digynia ——— two styles.
 Tetragynia ——— four ditto.
 Heptagynia ——— seven ditto.

CLASS VIII.

OCTANDRIA—*Eight Stamens.*

This class is subdivided into four orders, viz. *Monogynia*, *Digynia*, *Trigynia*, and *Tetragynia*.*

The class, *Octandria*, embraces several natural assemblages of vegetables, namely, *Epilobium*, *Gaura*, *Oenothera*, *Rhexia*, and *Osbeckia*; these plants, among other peculiar characters, have the corolla and the stamens inserted into the calyx. The *Vaccinium* (Whortle-berry), and the immense family of *Erica* (Heath), also belong to this class. Little is known of the medicinal properties of the plants comprehended under the term *Octandria*, but most of them are esculent and wholesome.

For an illustration of this class, see Plate 7, figs. 1 and 2.

CLASS IX.

ENNEANDRIA—*Nine Stamens.*

This class is subdivided into three orders, viz. *Monogynia*, *Trigynia*, and *Hexagynia*.†

* For explanation, see previous orders.

† Hexagynia, having six styles.

The genera which belong to the class Enneandria affords assemblages more or less natural. Among them are *Laurus*, *Anacardium*, *Rheum*, together with *Callitriche*, *Blitum*, *Corispermum*, *Rubex*, *Polygonum*, and several others.

This class, though a very small one, contains a number of important vegetables; for instance, there is *Camphor*, (the produce of the *Laurus Camphora*;) *Cinnamon*, (the produce of the *Laurus Cinnamomum*;) and *Cassia*, (the produce of the *Laurus Cassia*;) there is also the *Laurus Benzoin*; the *Laurus Sassafra*s, (*Sassafras*;) and the different species of *Rheum* (*Rhubarb*).

For an illustration. see Plate 7, fig. 3.

CLASS X.

DECANDRIA—*Ten Stamens*.

It is proper to observe here, that in order to constitute a pure decandrous plant, it is necessary that the ten stamens be distinct from each other, that is, that they be not united together, either by their filaments below, or by their anthers above.

Professor Milne and some other writers have affirmed that the stamens of the plants of this

class must be of an equal length; but this circumstance is not essential to the character *Decandria*; many plants, in which division have their stamens of unequal lengths, as the *Rhododendron*, &c.

The orders of this class are six, viz., *Mono-gynia*, *Digynia*, *Trigynia*, *Tetragynia*, *Pentagynia*, and *Decagynia*.*

The class contains a most numerous and beautiful tribe of vegetables, and at the same time it has strong pretensions to the exhibition of a natural arrangement. In medicine it is by no means unimportant, since we find in it the *Guajacum officinale* (which produces the *Gum-resin Guaiacum*;) the *Tolufera Balsamum* (which furnishes the *Balsam of Tolu*;) the *Myroxylon Peruiferum*, (producing the *Balsam of Peru*;) the *Cassia Senna*, (from which is obtained the *Senna* of the shops;) the *Melia Azedarach*, (which, in *Dr. Durall's inaugural dissertation at Philadelphia* in 1802, is described to be an invaluable anthelmintic;) different species of *Quassia*, (particularly the *Simaruba* and *Amara*;) *Kalmia latifolia*, and *Angustifolia*; *Rhododendron Chrysanthum*, and various others.

For an illustration, see Plate 8, figs. 1, 2, 3.

* Decagynia, having ten styles.

CLASS XI.

DODECANDRIA—*Twelve Stamens.*

It must not be supposed, that all the plants of this class have the precise number of stamens which the name imports. Several of the genera have more than twelve of these organs; whilst others have fewer than the characteristic number. Thus, *Bocconia* has from eight to twelve, or more; *Hudsonia* from ten to fifteen, (generally ten, rarely more than twelve); *Befaria*, fourteen; *Peganum*, *Nitraria*, and others, fifteen; and *Garcinia*, and *Bassia*, sixteen stamens. Some few of the genera have nineteen stamens, and *Agrimonia* has from twelve to twenty.

According to Linnæus, this class embraces those plants having androgynous flowers, and which possess from twelve to nineteen stamens each; but this is not the essential feature of the class *Dodecandria*. The precise character of this class is, that the stamens (or in place of them the anthers), of whatever number, are inserted into the receptaculum, (receptacle.) *By the place of insertion*, we very readily distinguish the plants of this class from those of *Icosandria*; for in this last the stamens are inserted either into the calyx or into the petals. It is to be lamented that it is not so easy to distinguish the plants of *Dodecandria* from those of *Polyandria*

for in both, the insertion of the stamens is the same, and upon investigation it will also be seen that not a few of the plants of Polyandria are to be found which have less than nineteen or even twelve stamens. Dr. Martyn was most decidedly in error, when in his "*Language of Botany*," he asserted that the class *Dodecandria* comprehends "all those plants which have androgynous flowers with from twelve to nineteen stamens inclusive."

From this view of the subject, it must appear evident, that the class *Dodecandria* offers a considerable difficulty to the student in the study of plants, upon the principles of the Linnæan system; but it is not easy to see how this difficulty can be obviated, unless the plan of the learned *Crantz* were to be followed: he proposed to abolish the class *Dodecandria* altogether, and dispose of the genera, (as now arranged,) in different classes, according to the number, insertion, &c. of the stamens; a remedy, it may be feared, more dangerous than the disease.

This class (*Dodecandria*) is subdivided into five orders, viz. *Monogynia*, *Digynia*, *Trigynia*, *Pentagynia*, and *Dodecagynia*.*

The different genera which it contains have very little natural affinity to each other; and it cannot be asserted that the class is a natural one. It is not of much importance in a medicinal point of view.

For illustrations, see Plate 8, figs. 4, 5, 6.

* *Dodecagynia*, twelve styles.

CLASS XII.

ICOSANDRIA—*Twenty Stamens.*

This class embraces those androgynous flowers which are furnished with twenty or more stamens, inserted into the calyx, or into the inner side of the petals. By this last-mentioned circumstance, and not by the mere number of the stamens, is the class *Icosandria*, particularly distinguished from the class Polyandria, which is the next to be treated of.

Many Polyandrous plants are not furnished with more stamens than the plants of the class Icosandria; on the contrary, we find that not a few of the genera which Linnæus has arranged in the 13th class, have constantly fewer than twenty stamens. Here then, we once more enter into the region of supposed difficulties and doubts with respect to the discrimination of the classical characters of the system of Linnæus—and, as a question, it is not unfrequently asked, how are we to distinguish the classes Icosandria and Polyandria?—the answer may be, first, from the circumstance that, in the plants of the class Icosandria, the stamens, whatever may be their number, are inserted into the calyx, or into the sides of the petals; whereas, in the class Polyandria, the

stamens are inserted into the receptacle of the flower ;—there is also another character by which the Icosandrian plants may be distinguished from those of the class Polyandria; and that is, the Icosandria have a concave calyx which is composed of one leaf, to the inner side of which the petals are fastened by their ungues or claws.

This class is subdivided into five orders ; viz. *Monogynia*, *Digynia*, *Trigynia*, *Pentagynia*, and *Polygynia*.

The class Icosandria might, with some degree of propriety, be denominated the *Esculent class*, for, in the Linuæan system, there is no class of the same extent to which we are indebted for such a number of fine esculent vegetables of the fruit kind. The fruits of some species of the *Cactus*, or *Indian Fig*, are deemed good eating,—some species of *Eugenia* also afford excellent fruits, but the finest and most substantial fruits of this class are those of the genus *Amygdalus*, comprehending the *Peach* and *Almond* ; different kinds of *Prunus*, known by the names of *Plum* and *Cherry* ; of *Pyrus*, or *Apples* and *Pears* ; of *Mespilus*, or *Medlars* ; of *Rubus* or *Bramble*, (such as the *Rubus idæus*, or *Raspberry*, the *Rubus cæsius*, or *Dewberry* ;) of *Fragaria*, or *Strawberry*, and others ;—we therefore see that although the class Icosandria cannot be said to be a natural class, in the strict sense of the term, yet it cannot be denied, that it embraces several

great assemblages of vegetables which are related by striking family affinities.

To the *Materia Medica*, this class does not give many important articles; some, however, deserve to be mentioned. The genera *Eugenia* and *Myrtus* furnish the *Clove* and *Pimento*: the shells of the *Punica*, or *Pomegranate*, and the root of the *Tormentilla*, or *Tormentil*, are still employed as astringents; and different species of *Geum*, or *Avens*, have acquired some reputation as substitutes for the *Peruvian Bark*.

For an illustration, see Plate 9, fig. 1.

CLASS XIII.

POLYANDRIA.—*Many Stamens.*

The thirteenth class is denominated *Polyandria*, from the Greek word Πολυς, signifying many. This class embraces those vegetables bearing androgynous flowers, and which are furnished with stamens that are inserted into the receptacle of the flower. It has already been observed, that it is by this circumstance, (though it is not expressed in the name of the class,) that the *Polyandrous* vegetables are to be distinguished from those of the class *Icosandria*.

It is said by Linnæus that the number of stamens in this class is generally from twenty to a thousand. It is true that it contains many plants furnished with a number of stamens, far exceeding twenty; such as the *Poppy*, *Capparis*, *Cistus*, *Ranunculus*, and others. But in the class *Icosandria*, there are not a few genera which are as abundantly supplied with these organs; such is the case with the *Cactus*, *Eugenia*, *Rosa*, and others. By attending, however, to the different modes of insertion in the many-stamened plants, we shall have no difficulty in referring them to their proper classes.

From the striking distinction between the two classes, it will be evident how rash and unjustifiable was the innovation made by *Professor Gmelin*, who in his edition of the *Systema Naturæ*, has united the two classes *Icosandria* and *Polyandria* into one, for which he retains the latter name.

The classes in question should be kept apart, not merely in subordinate but as principal divisions, for nature is remarkably regular and constant in the place of insertion of the Stamens. This is referred to for the sake of simplicity, for by uniting or rather confounding the two classes, we render the Linnæan system much more artificial than it really was when it came from the hands of its founder, and we thus deprive it of one

of its advantages, its *occasional* approach to a *natural arrangement*. Notwithstanding the avowedly artificial character of the system of Linnæus, it certainly sometimes presents a natural assemblage; and if this be degenerated, it may be inferred, that in proportion as it is rendered *more* artificial, it will lose a proportionable part of its value.

It has been observed, that the class *Icosandria* contains a great number of esculent and innocent vegetables; now the class *Polyandria* abounds in poisonous vegetables; here is, therefore, another grand difference in the two, and which should alone have been sufficient to prevent the union so injudiciously made by Gmelin.

Whilst, however, the incorporation of the *Icosandria* with the *Polyandria* is highly objectionable, it may be admitted that the latter of these classes might, to a certain extent, be beneficially united with the class *Dodecandria*; all the true *Dodecandrous* plants having more than ten stamens, might be introduced to the class *Polyandria*. This would greatly facilitate the labour of the student; for, after being told that the *Dodecandrous* plants have from twelve to nineteen stamens inclusive, what propriety can he or she discern in the placing under the class *Polyandria* a number of genera in which no botanist, perhaps, has ever observed nineteen

stamens; in which, at least, the number nineteen is exceedingly rare? In *Podophyllum*, *Sanguinaria*, and some other genera, we seldom observe more than fifteen or sixteen stamens.

The class *Polyandria* is subdivided into seven orders; viz. *Monogynia*, *Digynia*, *Trigynia*, *Tetragynia*, *Pentagynia*, *Hexagynia*, and *Polygynia*.

By some writers, this has been deemed a natural class; there is, however, no sufficient reason to consider it as such, though it unquestionably makes nearer advances to the natural, than some other classes. It is one of those which comprehends several pretty natural families of vegetables, that are related to each other by affinities, more or less striking.

Medicinally, the class *Polyandria*, is one of the most important in the Linnæan system; not, however, so much owing to the number of pharmaceutical articles which it affords, as to the value of a few of them. Of these, the most valuable is *opium*.

For an illustration of this class, see Plate 9, fig. 2.

CLASS XIV.

DIDYNAMIA*—*Two-powers.*

In all the preceding classes the orders are founded upon the number of the styles; to this circumstance, however, Linnæus has paid no attention in constructing the orders of this and of the succeeding ten classes. It is worthy of remark that in this, as well as in the classes *Tetradynamia*, *Diadelphia*, and *Syngenesia*, there is no plant to be found with more than one pistil.

The androgynous flowers of the plants in the class *Didynamia*, like those of the fourth class, are furnished with four stamens; but this is the only point of resemblance. In the class *Tetrandria*, as has been observed, the stamens are all of one uniform length, or at least there is no regular inequality between them; whereas in the plants of the class *Didynamia* two of the stamens are constantly long, and two short; they are also disposed in pairs, the outer pair being longer; the middle pair shorter, and their anthers converging or inclining towards each other. This class is subdivided into two orders, viz. *Gymnospermia*

* From *δύς*, twice; and *δύναμις*, power.

and *Angiospermia*; the latter signifying seeds enveloped, the former seeds not enveloped.

Gymnospermia—seed not enveloped : Order 1st.

This order contains those *Didynamous* plants, which are destitute of a proper pericarp, or seed vessel, and have four unenclosed seeds,—an exception however must be made to this rule, the plants *Prasium* and *Phryma*; the former of which has its seeds enveloped in a succulent epidermis, which may, with some propriety, be considered as the pericarp of this plant; in the latter, instead of four unenclosed seeds, we find but one.

Angiospermia—seed, enveloped : Order 2d.

The order *Angiospermia* contains those plants, marked by the *classical* character, but which have their seed lodged in a proper pericarp, or seed vessel.

This is a constant characteristic, and pointedly distinguishes the plants of this order from those of the preceding division. Linnæus has asserted, that the class *Didynamia* is a natural class; and that it contains no genus which does not in strict propriety belong to it. He places the essential characteristics of the class in the circumstance of the plants having four stamens; two of which are long and two short, in their

converging or inclining towards each other, of their possessing but one style, and in the corolla being of an irregular shape ; there is, however, a good reason for denying it to be a natural class, though it certainly approaches to that character much nearer than several others in the Linnæan arrangement ; but the very great affinity existing between the *Diandrous* plants with ringent flowers and the plants of the first order of *Didynamia* will justify a dissent in this instance from the judgment of Linnæus.

The two orders into which this class is subdivided exhibit two vast assemblages of vegetables, each characterized by a set of features which all but exclusively belong to it ; indeed the two orders are so dissimilar, that Dr. Milne says, “it would have been difficult, except from the number and proportions of the stamina, to have reduced them under one head, with any degree of certainty and propriety. The petals, seed-bulb, seed-vessel and seed, are totally different in the two orders ; the habits too, as well as the general appearances of the plants, are perfectly different.”

For an enumeration of the various characters, or features, which shew an affinity of the plants of this class to one another, we must refer the student to that elaborate work, the *Genera Plantarum of Linnæus*.

In a medicinal point of view, this class has little claim to consideration; but from the circumstance that the second order of it embrace a great number of genera, which are named in honour of distinguished botanists and naturalists, a late ingenious writer, Dr. Pulteney, observed that it might "be styled the *apotheosis* of botanists; and Linnæus may be compared to the high priest, who has thus immortalized a numerous group of celebrated men."

For illustrations of the class Didynamia, see Plate 10, figs. 1 and 2.

CLASS XV.

TETRADYNAMIA*—*Four-powers.*

This class embraces those plants which have androgynous flowers possessing six stamens, four of which are long, and two short. By this character, we readily distinguish the plants of this from those of the class Hexandria. The subjects of these two divisions of the Linnæan method differ widely from each other, as far as regards their aspect or physiognomy; but at the same time it must be allowed, that between their properties there exists a much greater affinity than seems to have been suspected.

* From *τεσσαρες*, four, and *δυναμις*, power.

This class is subdivided into two orders, *Siliculosa* and *Siliquosa*, and which are founded upon the circumstance of the form of the pericarp, or seed-vessel. This has been described a species of pod, in which the seeds are alternately fixed to either suture, or joining of the valves.

Siliculosa—*With Silicles*: Order 1st.

The plants of this order are furnished with that particuar species of pericarp which we have called *Silicula*, *Silicle*, or little pod, or pouch.

Siliquosa —*with Siliques*: Order 2d.

The plants of this order are furnished with that species of pericarp which has been called *Siliqua*, or *Silique*; and it may be repeated that the *Silicle* and the *Silique* do not essentially differ from each other; they vary only in form and size, in the latter the length greatly exceeds the breadth, as is seen in mustard; the former is almost round, or makes a nearer approach to the orbicular figure; as in *Lunaria* (Honesty), and *Thlaspi* (Shepherd's purse.)

The class *Tetradynamia* is, unquestionably, the best entitled of all in the Linnæan system to the epithet natural. If we except the genus *Cleome*, which is a very irregular family, allied

both to the *Polyandrous* and *Gynandrous* plants, the whole class does not contain a single genus which ought, agreeably to the laws of any *natural* system, to be excluded from it.

All botanists, as Linnæus himself has observed, have perceived the affinity which subsists between the plants of this class; *Morisson*, *Herman*, *Ray*, and *Boerhaave*, had, long prior to the publication of Linnæus' writings, denominated these plants *Siliquosæ* and *Siliculosæ*. *TOURNEFORT* has denominated them *Cruciformes*; *HALLER*, *Cruciataæ*; and *JUSSIEU*, *Cruciferæ*. *TOURNEFORT* and *HALLER* have disposed of these plants under the two general heads, adhered to by Linnæus; founding their divisions from the same data, viz. the form of the pod.

The terms *Cruciformes*, *Cruciataæ*, &c. were imposed upon these plants, from the form of the Corolla, which has already been noticed at page 112.

The following remarks apply generally to the plants of this class:

Hitherto there has not been discovered any instance of a true tree in the whole class: though some species, however, are shrubby; the root is fibrous, fusiformis, or tuberose; few, if any, are furnished with a bulb, in the Linnæan sense of the word: the caulis, or stem, is mostly her-

baceous; the leaves are alternate; they have neither stipules, tendrils, nor prickles: in most species the flowers are disposed in a corymb, which is gradually elongated into a raceme, so that while the flowers are corymbose, the fruit is racemous: the calyx is tetraphyllous, or four-leaved, and in most species deciduous: the petals are four, and, for the most part, unguiculate, or clawed; some few species, however, have flat petals; whilst others (a very rare occurrence,) are entirely destitute of petals. The number and form of the stamens have already been mentioned; but it is necessary to state, there are two or three exceptions; for example, some species of *Lepidium* are strictly *Hexandrous*; that is, there is no regular inequality in respect to the length of the stamens. The *Cardamine Hirsuta* has frequently no more than four stamens, the two shorter ones being deficient. In the *Cleome*, the number of the stamens is very various. The fruit is two-valved, and two-celled, and generally contains many seeds; but in two instances, viz. in the *Isatis* and *Crambe*, the fruit contains but a single seed. The general properties of the *Siliqueose* plants are well known; they have an acrid, lixivial taste, which in some species, whilst growing in their wild state, is very powerful; as is experienced in the *Cochlearia Armoracia* (Horse-radish), and the

Sinapis (Mustard). Even the turnip, upon naturally wet ground, contracts a remarkable acrimony.

It would seem, indeed, that the properties of the *Tetradynamous* plants are more remarkably and speedily influenced by the soil and climate in which they grow, than any other class of plants, the *Umbelliferae* not excepted.

The class *Tetradynamia* is, upon the whole, a very important one, since it furnishes several alimentary articles, which are highly useful: such as the Turnip, the different varieties of Cabbage, &c.: it likewise affords many stimulating articles, such as Mustard, Horse-radish, &c. which are used as *condiments*. To the resources of the healing art it contributes little; but, on the other hand, it contains few plants of a poisonous quality, perhaps none, if we except the seeds of the *Raphanus*, and *Raphanistrum* (White Charlock).

For illustrations of the class *Tetradynamia*, see Plate 11, fig. 2.

CLASS XVI.

MONADELPHIA* — *One Brotherhood; or
Filaments united into a Cylinder.*

This large and interesting class comprises those vegetables having androgynous flowers, and which have all their stamens united below, that is, by their filaments, into one body, or cylinder, through which the pistil passes. This class is a natural one, and the best proof of this, is the fact, that almost every botanist, in pursuit of a natural method, has associated under one head, the greater number of the *Monodelphous* plants; though they have constructed their systems upon principles very different from those of LINNÆUS. The vegetables of this class have, in general, permanent calyx, which, in many of the genera, is double; though, more frequently, it is single. It is double in *Malva*, *Alcea*, &c.; single in *Gordonia*, *Morisonia*, *Stewartia*, *Adansonia*, and others.

The petals are five in number, and are somewhat heart-shaped, closely embracing each other

* From *μονος*, one, or alone, and *αδελφια*, a brotherhood.

above, so as to assume the appearance of a single petal. Tournefort considered many of the *Malvaceous* plants to be monopetalous; but the corolla is, unquestionably, polypetalous, although the petals, when they fall, cohere together, which is owing to the intimate connexion which subsists between the filaments and the petals. The petals, indeed, appear to be a continuation of the filaments, or the filaments a continuation of the petals. The filaments, as has been observed, are united into a body, or cylinder, below, but are detached above: the anthers are lightly attached to the filaments, by the middle; the receptacle, or that part to which the flower and the fruit are attached, is prominent in the centre of the flower, and the seeds are kidney-shaped.

The subjects of the class *Monadelphia*, vary much in size. It comprehends some of the smaller vegetables known to us, and many of the most stupendous trees that have hitherto been discovered. Thus, some of the creeping Mallows (*Malva rotundifolia*, &c.) seldom arrive to the height of six inches: whilst the Silk-cotton tree (*Bombax pentandrum*), is so large, and spreads its branches so widely, that, according to William Bosman, a whole brigade might be manœuvred under its shade, without inconvenience. This vast vegetable is a native of Africa and South America. The *Adansonia*

digitata (Ethiopian Sour gourd), is another magnificent tree; it is a native of Senegal, in Africa, and is known to acquire the diameter of twenty-five feet, that is, seventy-five in circumference; in proportion to its bulk, so is its age. In the year 1749, the learned Mr. Michael Adanson saw two of these trees in the neighbourhood of *Goree*, upon one of which was inscribed the date of the fourteenth, and upon the other that of the fifteenth century! Yet, there was good reason to suppose, that the trees were not young when the dates were cut. It may therefore be conjectured, upon very plausible grounds, that these trees sometimes attain the age of eight or nine hundred years: an immense period for the existence of any species of organized bodies!

The class *Monadelphia*, is by no means the least important in Linnæus' system. It furnishes us with many valuable articles; for instance, the different species of *Gossypium* (Cotton), are subjects of this class: the species which is at present cultivated with so much success in the *United States of America*, and with so much emolument to that country, is the *Gossypium herbaceum*, a native of the *East Indies*.

To the *Materia Medica* this class gives few important articles; but, from the mild mucilage with which they abound, there can be little.

doubt that many more of the *Monadelphous* plants might be used with great advantage as articles of diet, than are at present made subservient to the supply of our wants in this respect.

The *Orders* of the class *Monadelphia* are nine in number, and are founded upon the number of stamens; in conjunction, as already stated, with the union of the filaments into a cylinder. The names of these *Orders*, with the exception of the seventh, are the same as those of several of the preceding classes; namely, *Triandria*, *Pentandria*, *Heptandria*, *Octandria*, *Enneandria*, *Decandria*, *Endecandria*, *Dodecandria*, and *Polyandria*.

For an illustration of the class *Monadelphia*, see Plate 11, fig. 2.

CLASS XVII.

DIADELPHIA—*Two Brotherhoods; or Filaments united into Two Cylindrical sets.*

The class *Diadelphia*,* contains those plants having androgynous flowers, which have their

* From *δύς*, twice; and *ἀδελφος*, a brother.

stamens united below into *two* sets of cylindrical filaments. So much, at least, is implied by the name of the class; but, unfortunately, the student will often find that a plant which Linnæus has referred to this great section of his system, has, strictly speaking, only one set of united filaments. In many of the genera, the stamens are all united; that is, all into one set, generally with a slit down the upper side of the tube; these really are not *Diadelphous*, but *Monadelphous*, and are great stumbling-blocks to beginners. It is but just to add, in the words of Dr. Milne, "That the names given by former botanists to the numerous class of plants in question, are much more characteristic of their nature and appearance than that of *Diadelphia*. In fact, the figure of the flowers and the fruit of the vegetables of this class never varies, the latter being always of the pod-kind; the former of a butterfly shape. On the other hand, it is again to be lamented, that the two sets of united stamina, the only classic character expressed in the Linnæan title, are never to be traced without difficulty; for one of the sets only is properly united; the other consists of a single filament, which, in most plants, adheres so closely to its kindred set, that it cannot be separated without the application of some sharp-pointed instrument for that purpose.

In some, even no separation can be effected by this means.”*

The *Orders*, or secondary divisions of the class *Diadelphia*, are founded on the number of the stamens, considered as distinct, and are as follow:—*Pentandria*, *Hexandria*, *Octandria*, and *Decandria*.

These plants correspond to the *Leguminosæ*, (or plants having legumes,) of MORISON, HERMANN, BOERHAAVE, RAY, and ROYEN: the *Tetrapetali irregularcs* of RIVINUS and CHRISTOPHER KNAUT: the *Tetrapetali diffformes* of Christian KNAUT; and the *Papilionacei*, or Butterfly-shaped flowers, of TOURNEFORT and PONTEDERA. The *Diadelphous* plants are also arranged by LINNÆUS in his thirty-second *natural order*, *Papilionaccæ*; and by MONSIEUR DE JUSSIEU, in his vast order *Leguminosæ*, the eleventh of his fourteenth class.

The class *Diadelphia* is, in several respects, one of the most important classes; for it embraces a considerable number of vegetables, which constitute valuable articles of food to man, and other animals. The seeds of some of these, such as various species of *Pisum*, *Phaseolus*, *Dolichos*, *Lathyrus*, and *Vica*, are among the number of

* Milne's Botanical Dictionary, &c., article, *Diadelphia*.

the most nutritious articles with which we are acquainted. In these the farinaceous matter is combined with a large portion of essential oil, and the saccharine principle, or sugar; hence, they contain three of the most nutritious principles of vegetable matter.

This class also furnishes some very valuable medicines; the principal of the plants from which they are derived belong to the genera *Fumaria*, *Polygala*, *Glycyrrhiza*, *Galega*, and the *Geoffroya*. Many others might be mentioned; this class also affords some very important *Plantæ tinctoriæ*, or dying plants; such as the *Indigofera tinctoria*: from the leaves and small branches of this vegetable, which is a native of *India*, is prepared that valuable dye which is so well known by the name of *Indigo*. The leaves, &c. of the *Podalyria tinctoria* (Wild Indigo), yield a coarse violet-coloured *secula*; the branches of *Genista tinctoria* (Dyer's Broom), are employed to give a yellow colour; and from the leaves of the *Coronilla emerus* (Scorpion Senna), a dye is procured from precipitation, after the acetous fermentation has taken place.

For an illustration of the class *Diadelphia*, see Plate 12, fig. 1.

CLASS XVIII.

POLYADELPHIA—*Many Brotherhoods.*

This class embraces those plants having androgynous flowers, and which have the stamens united by their filaments into three, or more, distinct bundles.

The Orders of this class are founded upon the number of the stamens, in conjunction with the peculiar mode of union above adverted to, and are called *Pentandria*, (having five stamens;) *Dodecandria*, (twelve stamens;) *Icosandria*, (twenty or more stamens;) and *Polyandria*, (many stamens.)

The class *Polyadelphia*, has but little claim to the character of a natural one; according to Dr. J. E. Smith, “it is both small and unnatural,” though we find many of its genera arranged in the different natural orders of botanists, who dissent from the system of Linnæus.

As this is one of the smallest, so it is also one of the least important classes in the Linnæan arrangement; nevertheless, it furnishes us with some vegetables, which those who are devoted to the luxuries of the palate would be unwilling to forego. That highly nutritious and agreeable

article, *Chocolate*, is prepared from the nuts of the *Theobroma Cacao*, a native of *South America*. Linnæus, it has been observed by Mr. Pennant,* must have been much attached to the use of this article, as he has given to it a name which imports nothing less than “the food of the gods.”† The different species of the *Citrus Aurantium* (Orange), and the *Citrus Medica* (Lemon), are also among the finest and most wholesome fruits that have hitherto been discovered.

From a species of the genus *Hypericum Bacciferum*, a native of India, we obtain one of the varieties of *Gamboge* that are in use; except this, we obtain no indispensable or even slightly important medicinal article from the class *Polyadelphia*.

For an illustration of this class, see Plate 12, fig. 2.

* An American.

† *Theobroma*, from Θεός, God; and Βρομα, food.

CLASS XIX.

SYNGENESIA*—*Confederate Anthers.*

This vast class comprehends those plants having androgynous flowers, in which the anthers are, in a majority of cases, united into a cylinder, whilst the filaments, by which they are supported, are separate and distinct.

The *Orders* of this very extensive class of plants arise from the proximity or remoteness of the florets composing the inflorescence, and which are contained within a common calyx,† respectively producing both stamens and pistils; stamens and pistils occupying separate and distinct calyxes: corollas destitute alike of one or both of these organs; and corollas miscellaneous and irregularly occupying or possessing one, both, or neither of them. This class has been denominated by Linnæus, *polygamia Florum*, and so far as the indiscriminate and irregular association of stamens with the pistils is concerned, it characterizes the Linnæan analogical method most faithfully. It is difficult

* From the Greek *συν*, sun, together; and *γενεσις*, genesis, birth.

† Perianthium commune.

to decide satisfactorily between the claims of Linnæus and some other writers; but the severe truth appears to be, that although the last of the orders of this class, as appropriated by Linnæus, is open to exception; the previous five have a title to be retained, each of them manifesting a great uniformity of structure.

In the formation of the orders of this class, Linnæus has followed out his favorite hypothesis and analogies to an unusual extent; but, with the exception of the 6th Order, there is no great reason to differ from him.

THE SUBDIVISIONS OR ORDERS ARE MADE AS FOLLOW ·

- | | | |
|------|-------------|------------------------|
| 1st. | Association | <i>Æqualis</i> . |
| 2d. | „ | <i>Superflua</i> . |
| 3d. | „ | <i>Frustranea</i> . |
| 4th. | „ | <i>Necessaria</i> . |
| 5th. | „ | <i>Segregata</i> , and |
| 6th. | „ | <i>Monogamia</i> . |

FIRST ORDER.

Association Æqualis—Equal.

IN the plants which form this order, the florets, or partial flowers, are all androgynous;

that is, each is furnished with both stamen and style; hence the term, *equal*. Most of the flowers of this order are furnished with the ligulate or strap-shaped Corolla; in a few instances they have the radiate Corolla.

SECOND ORDER.

Association Superflua—Superfluous.

In the plants of this order, the florets, in the centre of the disk, are androgynous; while those of the circumference, margin, or radius, are destitute of the stamens, but possess the style. The term superfluous is given to this species, because the fructification may be perfected by the florets of the centre alone, and without the assistance of the pistilliferous florets of the radius.

THIRD ORDER.

Association Frustranea—Frustraneous.

In this order we find the hollow florets in the centre of the flower to be furnished with both the stamens and style, while the flat florets in the radius, or circumference, are destitute of both; from this circumstance Linnæus considered

they may frustrate the capabilities of the androgynous flowers of the centre; an opinion not philosophical, but hence is the name of the order derived.

FOURTH ORDER.

Association Necessaria—Necessary.

In the plants of this order, the florets of the centre are furnished with stamens, while those of the radius are merely supplied with the pistil. By reason of the florets of this order not being androgynous, the order is termed necessary, because each of the florets possess one or other of the organs necessary to reproduction.

FIFTH ORDER.

Association Segregata.*

In the greater number of the plants of this order, the florets are androgynous; separated from each other by means of partial flower-cups, or perianths, which support one or more florets; these are then found to be collectively placed

* *Segregata*, literally means separate.

within a common Calyx, or Perianth. But for these circumstances it would be only a modification of the 1st and 4th orders, and the name which it bears would appear anomalous.

SIXTH ORDER.

Monogamia, Monogamy.

The 6th and last order contains simple flowers, in which respect it differs from all the preceding orders, the flowers of which are truly compound. In fact, the genera which Linnæus has referred to the order *Monogamia*, are so essentially different in their structure and in their aspect, from the plants of the preceding five orders, that Dr. Milne* has said, with much truth, that "Linnæus has offered a manifest violence to *Nature* by forcibly tearing many genera of plants from their proper places, and incorporating them with others, which are of a different and even opposite nature. In fact," continues Doctor Milne, "of all the numerous systems of botany there is not a single character which wounds nature so cruelly as that of Linnæus in this instance."

This criticism, unfortunately, is not too severe.

* See his Botanical Dictionary, article *Syngenesia*.

It must not, however, be supposed, that Linnæus has mixed and confounded the simple flowered plants of the order *Monogamia* with the compound flowers of the preceding orders of the 19th class, without having proceeded upon a rule of apparent consistency.

The name of the class *Syngenesia*, imports an union of anthers, or summits of the stamens; this may be said to be the classical character of the great body of plants thus associated.

So attentive, indeed, was Linnæus to this circumstance, that he has detruded from its proper place, among the compound flowers, a particular genus, that of *Kuhnia*, merely because the anthers of this plant are distinct; and has thrown it into the class *Pentandria*, where it is no less strangely associated than are the genera *Impatiens* (Balsam), *Lobelia* (Cardinal flower), &c., with the compound flowers of *Syngenesia*.

But it is not true that the anthers of all the plants which Linnæus has referred to the order *Monogamia*, are united into a cylinder; the anthers are separate in many species of *Lobelia* and *Violet*. Again, in some species of *Solanum*, or *Nightshade*, and in other genera, which are referred by Linnæus to the class *Pentandria*, the anthers are actually connate, or united into a cylinder!

Some of the warmest admirers of Linnæus, and those who have manifested the least disposition to innovate his system, have been obliged to forsake him in the arrangement of the genera which he has referred to the order *Monogamia*: thus, Dr. J. E. Smith, though he retains all the classes of Linnæus, has, with great propriety, abolished the last order of *Syngenesia*, and referred the genera which it contains to the first order of *Pentandria*.*

The class *Syngenesia*, with the exception of the order *Monogamia*, is a natural assemblage of plants. It embraces the great family of compound flowers, which is, unquestionably, a natural tribe, essentially distinct from the plants with simple flowers. The essence of these compound flowers is said, by Linnæus, to consist in the two circumstances of the union of the anthers into a cylinder, and a single seed placed below the receptacle, and attached to each floscule. The greater number of these plants are furnished with a common Calyx, or Perianth. In *Echinops*, however, the common Calyx is wanting; but it is present in *Scabiosa*, a plant which Linnæus does not consider a true compound flower.

In the majority of cases the compound flowers

* See Dr. J. E. Smith's *Flora Britannica*, a work of great merit.

are furnished with a common receptacle, but *Milleria*, one of these plants, is destitute of this; while, on the other hand, we have proofs of its existence upon *Scabiosa*, *Teasel* (Dipseacus), and *Globe-flower* (Gomphrena), although neither of these plants is referred by Linnæus to the arrangement of compound flowers.

Tournefort, Vaillant, and many other eminent botanical writers before Linnæus, had sought for the essential character of the compound flowers, in the presence of a common Calyx, and a common receptacle: but Linnæus rejected both of these as inadequate to the purpose, and, in their place, substituted the union of the anthers, and the situation of the seeds. In accordance with what was formerly advanced, it must be conceded that Linnæus, in having adhered thus *exclusively* to these characters, offered violence to nature.

The true Syngenesious plants are, compound flowers, consisting of a number of individual floscules, or florets. The following features constitute the principal natural character of such a floscule.

The Calyx is a corona seminis, or aigrette, sitting upon the apex of the germe.

The Corolla is monopetalous, furnished with a long and very narrow tube, sitting upon the germe.

This Corolla is,—

1st. *Tubulata*, tubulate, campanulate, or bell-shaped, quinquifid, laciniae, reflex, and spreading.

2d. *Ligulata*, ligulate, or strap-shaped; the limb, more properly border, linear, flat, turned outwards, dentate, and truncate.

3d. Possessed of the limb or border, and very rarely destitute of the tube.

The stamens, in the greater number of the species, are five in number: they are capillary, very short, and inserted in the neck of the corolla. The anthers are, also, five in number: they are linear, erect, cohering, by their sides, into a cylinder, which is quinquedentate, and of the length of the limb or border. In regard to the pistil: the germe is oblong, placed below the corolla, and above the common receptacle. The style is filiform, erect, of the length of the stamens, and perforates the cylinder formed by the anthers. The stigma is bipartite; the segments are revolute and spreading. These plants are destitute of a true pericarp, though in some of the genera, as in Bone-seed (*Osteospermum*), and *Strumpfia*, the seeds are enveloped in a coriaceous crust, and are oblong, often four-cornered, and frequently narrowed at the base.

Independently of their compound flowers, there is something in the aspect of the *Synge-*

nesious plants which emphatically distinguishes them from all others. It is not easy indeed to determine in what this peculiar character consists. Sir John Hill says, that these plants "have a weed-like appearance." There is considerable truth in this observation, for notwithstanding the beauty of their flowers, the prevailing colours of which are yellow and orange; the stems and the leaves, of a very great number, are rough and downy; and a spectator is induced to say of the class generally, "it has been less reclaimed from its wild or savage state than most other plants," with the exception of those of the 24th class.

The class *Syngenesia* is, in many respects, an important one. It furnishes us with many beautiful plants, and with not a few articles of diet and of medicine. Among the former may be named the *Common Garden-Lettuce* (*Lactuca sativa*); and a great many of the *Semifloscular* plants of the first order, also, are esculent. It is somewhat remarkable that, although the lactescent plants, or plants abounding in a milky juice, of the other classes are very poisonous, the milky plants of *Syngenesia*, with a very few exceptions, are entirely innocent. This circumstance will show the propriety of receiving, with hesitation, those general canons which have been proposed by the medical writers respecting the properties of plants, as deduced from their

general aspect or obvious qualities. Nevertheless, the general rule of Linnæus ought to be remembered, viz. "*Plantæ Lactescentes plerumque Venenatæ sunt.*"*

As medicinal plants, the *Common Dandelion*, (*Leontodon teraxacum*), a species of *Lettuce* (*Lactuca virosa*), and some species of *Serratula* and *Eupatorium*, are entitled to consideration. The famous *Chamomile* of the shops, is the *Anthemis nobilis*. Coltsfoot and Wormwood are also within the arrangement of this class.

For an illustration of the class *Syngenesia*, see Plate 13.

CLASS XX.

GYNANDRIA.†

This class contains those androgynous flowers, the stamens and pistils of which are situated upon, and supported by a pillar-shaped re-

* In general, the laetescient plants are poisonous.

† From the Greek words *γυνή*, woman, and *ανηρ*, man; a derivation in no way accordant with the characteristics of the class; the term *columnifera* would have been preferable.

ceptacle, something resembling a style, and which rises in the centre of the flower.

The orders of this class are founded upon the number of the stamens. Linnæus has subdivided the whole class into nine orders, viz. *Diandria*, *Triandria*, *Tetrandria*, *Pentandria*, *Hexandria*, *Octandria*, *Decandria*, *Dodecandria*, and *Polyandria*.*

In this subdivision most botanists who have retained a distinct class by the name of *Gynandria* have followed Linnæus. But the learned Professor Swartz, who devoted very particular attention to these plants, has shown, that what has generally been taken for *two* anthers, is nothing more than a *single anther bilobated*, or consisting of two lobes; and, consequently, that the greater number of the genera which Linnæus has thrown into the 1st order, (*Diandria*), of this class, ought to be referred to the order *Monandria*; this is so evident that no one can doubt the propriety of considering the additional subdivision an improvement upon the Linnæan system.

This has been called “an odd and miscellaneous class;” it has not, indeed, much claim to the character of natural arrangement, although

* For explanations see the Greek numerals, p. 168, and remark in third paragraph, p. 167.

Linnæus deemed the order *Diandria* to be a very natural assemblage of plants.

In regard to the properties of the *Gyandrous* plants, it may be observed, that many supply extremely nutritious articles: thus, the salep of the shops is the produce of the *Orchis morio*; and it has been shown, that from the bulbs of other species a very good salep might be produced. The properties of other genera of this class are very dissimilar, containing, as they do, a number of very active plants. The genera *Arum*, *Dracontium*, *Pothos*, and *Calla*, are acrid vegetables. The properties of the *Arum triphyllum* (Indian turnip), has received considerable attention; the fresh roots of it being boiled in milk, and thus taken for some time, has been found useful in consumption of the lungs. The *Aristolochia Serpentaria* (Virginia snake-root), is a medicinal article of great value. The pods of the *Epidendrum Vanilla*, of Linnæus (*Vanilla aromatica* of Swartz), have a very agreeable taste and smell; and are included among the articles in the *Materia Medica* of the *Mexicans*, under whose authority they enter into the composition of chocolate.

For illustrations of the class *Gynandria*, see Plate 14.

CLASS XXI.

MONÆCIA.*

The twenty-first class of the Linnæan system is essentially distinguished from all the preceding classes. It embraces those vegetables in which the stamens and the styles are placed apart; that is, within distinct covers (calyx or corolla, or both), but upon the same plant or individual. This peculiarity of disposition led Linnæus to name this class *Monæcia*; and although many single species, ranged under some of the preceding classes do, in strict propriety, belong to the class *Monæcia*, yet it is manifest that the flowers of the plants under consideration are not androgynous, as are the flowers of the plants of the preceding twenty classes; nor are the stamens and the styles, respectively situated upon distinct individuals of the same species, as is the case in the next (22d) class, or *Diæcia*.

The orders of this class are eleven in number; and, by Linnæus, are founded upon the circumstance of the *number*, the *union*, and the situation of the stamens, and are distinguished by the names

* From the Greek of *μονος*, alone; and *ὄνκια*, a house or habitation.

of some of the preceding classes, viz. *Monandria*, *Diandria*, *Triandria*, *Tetrandria*, *Pentandria*, *Hexandria*, *Heptandria*, *Polyandria*, *Monadelphia*, *Syngeusia*, and *Gynandria*. The last has been (by Dr. J. E. Smith) justly denominated “a paradoxical order.” How, indeed, can a plant belong to the class *Monœcia*, the character of which is to have the anthers and pistils in different covers of the same vegetable, and yet answer to the character of the class *Gynandria*, the peculiar feature of which is to have the anthers attached to the pistil, within the same calyx or corolla?

For an illustration of the class *Monœcia* (order *Polyandria*), see Plate 15.

CLASS XXII. .

DICÆCIA* — *Two Houses*.

This class contains those plants which have *no* androgynous flowers, but produce the stamiferous and pistiliferous flowers on distinct individuals of the same species. Thus the

* From the Greek *δύς*, twice, and *οἶκος*, a house.

character of the class *Diœcia* is essentially different from that of any of the preceding classes: for, in the first *twenty*, the flowers are all androgynous; and, in the twenty-first, separate corollas, seated upon different parts of the same plant, produce respectively the stamens and pistils: but in the class now under consideration, the same individual does not sustain either collective or distinct flowers possessing both the organs.

The orders of the class *Diœcia* are fifteen in number, and are founded upon the circumstances of the number, the union, and the situation of the stamens; and of course upon the same principle as the orders of *Monœcia*; they are as follow: *Monandria*, *Diandria*, *Triandria*, *Tetrandria*, *Pentandria*, *Hexandria*, *Octandria*, *Enneandria*, *Decandria*, *Dodecandria*, *Icosandria*, *Polyandria*, *Monodelphia*, *Syngenesia*, and *Gynandria*.

From a variety of circumstances this may be considered a natural collection of plants; Linnæus, as well as Jussieu, having arranged the genera of this class under the various orders of their respective natural systems.

The medicinal properties of the plants under consideration are not numerous; but the barks of different species of *Salix* and *Populus* have been found good substitutes for the Peruvian

bark; *Myrica* (Candleberry Myrtle), and *Viscum* (Mistletoe), have, likewise, been used as tonic medicines. The Sarsaparilla of the shops (an article of no great value,) is the root of the *Smilax Sarsaparilla*; a species of *Aralia Nudicaulis* (of Linnæus), is also called Sarsaparilla, and is frequently found in the shops, where it is sold for the genuine kind; to these may be added the berries of the *Juniperus Communis* (common Juniper), and the *Juniperus Virginiana* (Red Cedar); the powers of the latter being but little inferior to those of the former.

That important article *Humulus Lupulus* (common Hop), also belongs to this class.

It is a circumstance peculiar to the plants of the classes *Monœcia* and *Diœcia*, that the stamens and pistils make their appearance before the full evolution of the leaves, so that the farina or pollen of the *Anthers* may be carried more securely by the winds, or may be more directly deposited by their own gravity on the pistilliferous flowers; this is known to be the case in the Mulberry, Mistletoe, Alder, Birch, Hornbeam, Beech, Oak, Hazel, Walnut, Willow, Sea Buckthorn (*Hippophæ*), Dutch Myrtle (*Myrica*), Poplar, and the Dog's Mereury (*Mercurialis*.)

For illustrations of this class, (see Plate 16.)

CLASS XXIII.

POLYGAMIA.

This is a very extraordinary class; it is, to use Dr. J. E. Smith's words, also "a bad and unnatural class, variable and obscure."

In order that a plant should belong to it, it is absolutely necessary that some of its flowers should be androgynous; whilst, in addition, it may possess stamiferous, or pistilliferous flowers, or both; and these too may appear on one, two, or more plants or individuals.

The following are the various modes in which the association of the plants of this class are recognised, viz.

1st. Androgynous flowers, and flowers having stamens only, situated upon the *same* plant, as in White Hellebore (*Veratrum*), and others.

2d. Androgynous flowers, and flowers having stamens only, situated upon *distinct* plants or individuals, as in Ginseng (*Panax quinquefolium*), and others.

3d. Androgynous flowers, and flowers having *pistils* only, situated on the *same* plant or

* From *πολυς*, many, and *γαμος*, marriage or association.

individual, as in Pellitory (*Parietaria*), and Orach (*Atriplex*.)

4th. Androgynous flowers, and flowers having pistils only, situated upon *different* plants or individuals, as in many species of *Fraxinus*, or Ash-tree.

5th. Androgynous flowers, flowers having stamens only, and flowers having pistils only; each of these occupying *a distinct* individual, as in *Ceratonia* (Carob-tree,) and *Ficus* (Fig-tree.)

6th. Androgynous flowers, flowers having stamens only, and flowers possessing pistils only, situated upon *two distinct* plants or individuals, as in *Gleditsia Triacanthos* (Honey-Locust); in this instance we find the stameniferous and androgynous flowers placed upon one plant or individual, and the pistilliferous flowers upon another.

7th. This mode of association is termed *Frustranea*, from its flowers, although containing both stamens and pistils, having, at the same time, one of them abortive; in some, the stamens; in others, the pistil. We have an instance of this singular mode of association in the flowers of the famous Banana-tree (*Musa Sapientum*), whose striking name (the *Tree of Knowledge*), has excited so much curiosity.

The class of *Polygamia* is subdivided into

three orders, viz. *Monæcia*,* *Diaecia*,† and *Triæcia*.‡

A very considerable number of the plants which Linnæus has thrown into his classes of true androgynous flowers, do occasionally bear, beside those, flowers merely with stamens, or with pistils. It may be suspected, therefore, that if we were compelled to adhere with un-deviating obedience to the Linnæan rule, we should hardly find one very extensive genus of the system, in which some one species would not fall within the class *Polygamia*. It is certain that the same species of plants vary in a remarkable manner from the effects of different climates; indeed, the same individual has been observed to vary in different years, even in the same climate. “The great fertility and exuberance of the soil in some of the tropical isles, is perhaps one of the reasons,” says a learned writer,§ “Why such a number of their plants belong to the Linnæan classes of *Monæcia*, *Diaecia*, and

* Androgynous and stameniferous, or pistilliferous flowers growing upon the same plant.

† Androgynous and stameniferous, or pistilliferous flowers growing on separate plants.

‡ Androgynous, stameniferous, and pistilliferous flowers growing separately on three distinct plants of the same species.

§ Dr. John Reinhold Forster, LL.D

Polygamia; and it is remarkable that plants, which botanists have observed to be androgynous in America, here bear their stamiferous and pistilliferous flowers on two distinct shrubs; and this may confirm the opinion, that most *Diœcous* plants are somewhere or other also found in the androgynous state; which, if it were general, would necessarily set aside that class." Upon the whole, it were better that the class *Polygamia* should be suppressed, and the plants which it embraces referred to the other classes of the system. Amongst its numerous genera the class, as it stands, contains a great number of the grasses; and in the same class with these lowly plants is placed the magnificent Maple (*Acer Saccharinum*), from the juice of which is prepared an excellent sugar, but little, if at all, inferior to the best sugars obtained from the true sugar cane (*Saccharum-officinarum*), of India.

In a medicinal point of view this class does not afford any indispensable production; although it is true that the extensive family of *Mimosa*, commonly called sensitive plants, supply us with some useful, alimentary, and medicinal articles. The Gum Arabic of the shops, is the produce of the *Mimosa Nilotica*, which grows in Arabia, in Egypt, and in Senegal; and the extract of *Catechu*, commonly called *Terra Japonica*, is the produce of the *Mimosa Cate*.

In a physiological point of view, various species of *Mimosa* are among the most interesting vegetables that are known to us, for although we see no reason to believe that sensibility, the attribute of nervous matter resides in any part of any vegetable production; yet, there belongs to these plants, in an eminent degree, a principle closely allied to what, in the animal organization, is termed irritability. To those who have, or may accustom themselves to watch the movements of the *Mimosa*, the following lines will be fully appreciated.

“Weak with nice sense, the chaste *Mimosa* stands,
From each rude touch withdraws her timid hands;
Oft as light clouds o’er pass the summer-glade,
Alarm’d she trembles at the moving shade;
And feels alive, through all her tender form,
The whisper’d murmurs of the gathering storm;
Shuts her sweet eyelids to approaching night,
And hails with freshen’d charms the rising light.”

The Loves of the Plants. Canto I. 301, &c.

For an illustration of the class *Polygamia*,
see Plate 18, figures 1, 2, 3.

CLASS XXIV.

CRYPTOGAMIA.*

This class contains a vast assemblage of vegetables, in which the parts of fructification are, in many cases, either from their minuteness or from their particular situation, entirely concealed from the view, or only imperfectly visible. In a majority of the plants under consideration, it is impossible, even with the aid of a powerful microscope, to refer them to any order of any one of the preceding twenty-three classes; and although the evidence of the patient Italian botanist *Micheli*, who, in 1729, first discovered the real stamens and pistils in the Mosses—notwithstanding the confirmation of his observations by the subsequent fact of Professor Hedwig's having raised Mosses from seeds; and the now universal admission as to the existence of seeds in this tribe of plants—it yet appears that the subdivisions of the class *Cryptogamia*, as made by Linnæus, is to be unhesitatingly preferred to any other which may have taken its rise from observations that cannot

* From *κρυπτω*, to hide, and *γαμος*, association or marriage.

be verified upon an extensive scale; nor to the satisfaction of the unassisted sense.

The orders into which Linnæus subdivided this class are the five following, viz.

- 1st. *Filices*, comprehends the *Ferns*.
- 2d. *Musci*, „ „ *Mosses*.
- 3d. *Algæ*, „ „ *Sea-weeds*.
- 4th. *Fungi*, „ „ *Mushroom*.
- 5th. *Hepaticæ*, „ „ *Liverworts*.

Each of these possess most distinct features, habits, and qualities; and equally as distinct localities.

The ferns are very abundantly diffused over the whole earth; they are particularly plentiful in the West Indies and in North America, where they constitute a beautiful covering for the summits of many of the mountains. The roots of many of these vegetables creep and extend themselves in a horizontal direction, and not very far from the surface of the ground.

In the majority of this order (*Ferns*), the flowers are fastened to the back of the leaves; these are the true *dorsiferous ferns*. In others, however, the fructification is in the spikes; this is seen in *Ophioglossum*, *Osmunda*, and others; in which, the middle rib overtops the extremity of the leaf, or frond, and forms a stem upon which the flowers are supported; the leaves proceed either singly or in greater numbers, from

the extremities of the branches of the main root; and, in the greater number of the genera they are winged, or hand-shaped.

The *Ferns* appear to have been among the most ancient vegetable inhabitants of our earth; they are frequently found on, or impressed in stones of different kinds, particularly *Schistu*· (slate), and in nodules of iron stone in almost every part of the world; and it is a curious circumstance, that we frequently find these impressions, &c. in countries where the plants in a state of vegetation are no longer natives. The *Ferns*, found as petrified imbedments, do unquestionably furnish us with one, among many other facts, which might lead us to reflect that the globe we inhabit has undergone greater, but at the same time more gradual revolutions than the ordinary mind can conceive, or is willing to admit; and also to believe that the plants in question must have existed as members of the vegetable economy, at a period anterior to the date of those revolutions, of which the memory is preserved in the written monuments of mankind.

The Mosses, in the system of Tournefort, are termed *Aspermæ*, or plants without seeds; but we have seen that the seeds of the Mosses, and other plants belonging to the class *Cryptogamia*, have been discovered by the vigilant researches of Micheli, Hedwig, and others.

In the form and disposition of their leaves, in the manner of their growth, and in some other circumstances, the Mosses resemble the *Pines*, the *Firs*, and other *Coniferous* evergreens, which have already been mentioned. These plants frequently creep, and extend themselves like a carpet upon the ground, upon the trunks and branches of trees and shrubs, and upon various species of stones, being commonly collected into bunches or tufts. Some of the smallest plants with which we are acquainted belong to the Mosses; few of them attain to the height of a foot, whereas, among the *Ferns*, we have species that are even *arborescent*. Very few of the Mosses are annual plants; the greater number are perennial and evergreen: their growth is very slow, but they are extremely retentive of the principle of life; for after having been preserved dry for a century or more, they may be made to resume their primitive verdure, simply by moistening them with water.

The Mosses inhabit the hottest and the coldest climates; they vegetate generally with more rapidity in a cool and moist situation, with a north aspect, where they are screened from the sun; some few, however, are found in luxuriant growth on the margins of rivers with a south aspect.

The *Algæ*, sea-weed, or wrack, constitutes

the third order of vegetable development in the class *Cryptogamia*; they vary in dimensions from mere microscopic objects to a very large size, and are composed of cellular tissue in various degrees of combinations; so much so, as at times to appear to form a link between the two great kingdoms of organized matter; in many cases, and in addition to the general organs possessed by plants, (and of which these are not destitute,) we find them furnished with *Vesiculæ* filled with air, by means of which they are enabled to float.

Of *Fungi*, or the fourth order; the structure of these plants is yet more simple than that of *Algæ*, consisting of little besides cellular tissue, among which sporules (more properly seeds,) lie scattered. Some, in the lowest degree of development, are composed only of a few cellules, one of which is larger than the rest, and contains the seeds; others are differently compounded, possessing innumerable cellules, and consequently a corresponding quantity of seeds.

Of the last order, *Hepaticæ*. These differ remarkably from each other in the modifications of their organs of reproduction, while they have a striking resemblance in their vegetation. The most conspicuous organ of their vegetation, (and which corresponds with the *Caudex Ascendens*, as applied to the subjects of the other classes,)

bears the name of *Fron*d, or *Thallus*; it is either a leafy branched tuft, as in Mosses, with the cellular tissue particularly large, and the leaves frequently furnished with lobes, and appendages at the base, called *Stipulæ* or *Amphigastria*; or a sinuous flat mass of green vegetable matter lying upon the ground.

In *Jungermannia*, that part which is most obviously connected with the reproduction of the plant, and which bears an indisputable analogy to the *theca* of Mosses, is a valvular brown case, called the Capsule, elevated upon a white cellular tender seta, and originating from a hollow case arising among the leaves.

The *Lichens*, (which belong to this order,) have a lobed *frond* or *thallus*, the inner substance of which consists wholly of reproductive organs, which breaks through the upper surface in various forms; among which the following are the most conspicuous, viz.

1st. *Shields* (Scutella), little coloured cups with a dark disk, surrounded by a rim, and containing tubes filled with sporules or seed.

2d. *Soredia*, and which are heaps of powdery bodies scattered upon the surface of the thallus.

The nomenclature of the several parts of this order has been, as Dr. Lindley very properly

remarks, extended beyond necessity; but he as justly adds, "it is, however, absolutely indispensable that it should be fully understood by those who wish to read the systematic writers upon the subject." This, however, would far exceed the bounds of an elementary work; but it would be found of easy acquirement by reference to the fourteenth edition of the "*Systema Vegetabilium*," &c.

For illustrations of this XXIVth class, see Plate 18, figs. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15.

RECAPITULATION OF THE CLASSES,

ENUMERATING THEIR ORDERS BY EXAMPLES.

CLASS I.—*Monandria contains 2 Orders, viz.*

Orders.	Examples.
1. <i>Monogynia</i> , having one pistil.	<i>Salicornia</i> , (Jointed Glasswort.)
2. <i>Digynia</i> , „ two pistils.	<i>Callitriche</i> , (Starheaded Water Chickweed.)

CLASS II.—*Diandria contains 3 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Ligustrum</i> , (Privet.) + <i>Geranium</i> , (Speedwell.)
2. <i>Digynia</i> , „ two pistils.	<i>Anthoxanthum</i> , (Sweet-scented Vernal-Grass.)
3. <i>Trigynia</i> , „ three ditto.	<i>Piper</i> , (Pepper.)

CLASS III.—*Triandria contains 3 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Valeriana</i> , (Valerian.) <i>Crocus</i> , (Saffron.)
2. <i>Digynia</i> , „ two pistils.	<i>Gramina pleraque</i> , (most of the Grasses.)
3. <i>Trigynia</i> , „ three ditto.	<i>Montia</i> , (Water Chickweed.)

CLASS IV.—*Tetrandria* contains 3 Orders, viz.

Orders.	Examples.
1. <i>Monogynia</i> , having one pistil.	<i>Dipsacus</i> , (Teasel.) <i>Plantago</i> , (Plantain.)
2. <i>Digynia</i> , „ two pistils.	<i>Aphanes</i> , (Parsley-piert.)
3. <i>Tetragynia</i> , „ four ditto.	<i>Potamogeton</i> , (Pond-weed.)

CLASS V.—*Pentandria* contains 6 Orders, viz.

1. <i>Monogynia</i> , having one pistil.	<i>Primula</i> , (Primrose.) <i>Convolvulus. Lonicera</i> , (Honeysuckle.)
2. <i>Digynia</i> , „ two pistils.	<i>Gentiana. Centaurium</i> , (Centaury.) <i>Ulmus</i> , (Elm.)
3. <i>Trigynia</i> , „ three ditto.	<i>Viburnum</i> , (Wayfaring Tree.) <i>Sambucus</i> , (Elder.)
4. <i>Tetragynia</i> , „ four ditto.	<i>Parnassia</i> , (Grass of Parnassus.)
5. <i>Pentagynia</i> , „ five ditto.	<i>Statice</i> , (Thrift.) <i>Linum</i> , (Flax.)
6. <i>Polygynia</i> , „ many ditto.	<i>Myosurus</i> , (Mouse-tail.)

CLASS VI.—*Hexandria* contains 5 Orders, viz.

1. <i>Monogynia</i> , having one pistil.	<i>Hyacinthus</i> , (Hyacinth.) <i>Narcissus</i> , (Daffodil.)
2. <i>Digynia</i> , „ two pistils.	<i>Oryza</i> , (Rice.)
3. <i>Trigynia</i> , „ three ditto.	<i>Rumex</i> , (Dock.) <i>Colchicum</i> , (Meadow-saffron.)

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Orders.	Examples.
4. <i>Tetragynia</i> , having four pistils.	<i>Petiveria</i> , (Guinea-hen Weed.)
5. <i>Polygynia</i> , „ many ditto.	<i>Alisma</i> , (Water Plantain.)

CLASS VII.—*Heptandria contains 4 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Trientalis</i> , (Chickweed Winter Green.) <i>Æsculus</i> , (Horse-chestnut.)
2. <i>Digynia</i> , „ two pistils.	<i>Limeum</i> , (a native of Africa.)
3. <i>Trigynia</i> , „ three ditto.	<i>Saururus</i> , (Lizard's-tail.)
4. <i>Heptagynia</i> , „ seven ditto.	<i>Septas</i> , (a native of the Cape of Good Hope.)

CLASS VIII.—*Octandria contains 4 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Epilobium</i> , (Willow Herb.) <i>Erica</i> , (Heath.) <i>Daphne</i> , (Mezereon.)
2. <i>Digynia</i> , „ two pistils.	<i>Galenia</i> , <i>Weinmannia</i> , (Mountain Chickweed.)
3. <i>Trigynia</i> , „ three ditto.	<i>Polygonum</i> , (Bistort.) <i>Persicaria</i> , (Knotgrass.)
4. <i>Tetragynia</i> , „ four ditto.	<i>Paris</i> , (Herb Paris.) <i>Adoxa Moschatellina</i> , (Tuberous Moschatel.)

CLASS IX.—*Enneandria contains 3 Orders, viz.*

Orders.	Examples.
1. <i>Monogynia</i> , having one pistil.	<i>Laurus</i> , (Bay, Sassafras.)
2. <i>Trigynia</i> , „ three pistils.	<i>Rheum</i> , (Rhubarb.)
3. <i>Hexagynia</i> , „ six ditto.	<i>Batomus</i> , (Flowering Rush.)

CLASS X.—*Decandria contains 6 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Arbutus</i> , (Strawberry Tree.)	<i>Ruta</i> , (Rue.)
	<i>Pyrola</i> , (Winter-green.)	
2. <i>Digynia</i> , „ two pistils.	<i>Saxifraga</i> , (Saxifrage.)	<i>Dianthus</i> , (Pink.)
	<i>Saponaria</i> , (Soapwort.)	
3. <i>Trigynia</i> , „ three ditto.	<i>Cucubalus</i> , (Spatling Poppy.)	<i>Stellaria</i> , (Stichwort.)
4. <i>Tetragynia</i> , „ four ditto.	<i>Calligonum</i> , (a native of Mount Ararat.)	
5. <i>Pentagynia</i> , „ five ditto.	<i>Sedum</i> , (Stonecrop.)	<i>Oxalis</i> , (Wood-sorrel.)
6. <i>Decagynia</i> , „ ten ditto.	<i>Basella</i> , (American Nightshade.)	

CLASS XI.—*Dodecandria contains 5 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Asarum</i> , (Asarabacca.)
	<i>Lythrum</i> , (Purple-spiked Loosestrife.)

Orders.	Examples.
2. <i>Digynia</i> , having two pistils.	<i>Agrimonia</i> , (Agrimony.) <i>Heliocarpus</i> .
3. <i>Trigynia</i> , „ three ditto.	<i>Reseda</i> , (Dyer's-weed.) <i>Euphorbia</i> , (Spurge.)
4. <i>Tetragynia</i> , „ four ditto.	<i>Calligonum</i> , (a native of Mount Ararat.)
5. <i>Pentagynia</i> , „ five ditto.	<i>Glinus</i> , (a native of Spain.)
6. <i>Dodecagynia</i> , „ twelve ditto.	<i>Sempervivum</i> , (House- leek.)

CLASS XII.—*Icosandria contains 5 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Prunus</i> , (Black Thorn.) <i>Myrtus</i> , (Myrtle.) <i>Amygdalus</i> , (Al- mond.)
2. <i>Digynia</i> , „ two pistils.	<i>Cratægus</i> , (Hawthorn.)
3. <i>Trigynia</i> , „ three ditto.	<i>Sorbus</i> , (Mountain Ash.)
4. <i>Pentagynia</i> , „ five ditto.	<i>Mespilus</i> , (Medlar.)
5. <i>Polygynia</i> , „ many ditto.	<i>Rosa</i> , (Rose.) <i>Rubus</i> , (Bramble.) <i>Fragaria</i> , (Strawberry.)

CLASS XIII.—*Polyandria contains 7 Orders, viz.*

1. <i>Monogynia</i> , having one pistil.	<i>Papaver</i> , (Poppy.) <i>Nymphæa</i> , (Water- lily.)
2. <i>Digynia</i> , „ two pistils.	<i>Pæonia</i> , (Peony.)
3. <i>Trigynia</i> , „ three ditto.	<i>Delphinium</i> , (Lark- spur.)
4. <i>Tetragynia</i> , „ four ditto.	<i>Cimicifuga</i> , (a native of Siberia.)
5. <i>Pentagynia</i> , „ five ditto.	<i>Aquilegia</i> , (Colum- bine.)

Orders.	Examples.
6. <i>Hexagynia</i> , having six pistils.	<i>Stratiotes</i> , (Fresh-water Soldier or Sailor.)
7. <i>Polygynia</i> , „ many ditto.	<i>Adonis</i> , (Pheasant's Eye.)

CLASS XIV.—*Didynamia* contains 2 Orders, viz.

1. *Gymnospermia*, having its seeds situated
at the bottom of the Calyx. } *Glechoma*,
(Ground-ivy.)
2. *Angiospermia*. „ its seeds contained in a Pericarp. } *Digitalis*,
(Fox-glove.)

CLASS XV.—*Tetradynamia* contains 2 Orders, viz.

1. *Siliculosa*, having its seeds in a small, } *Lunaria*,
short, or round pod. } (Honesty.)
2. *Siliquosa*, „ its seeds in a long } *Cheiranthus*,
slender pod } (Wall-flower.)

CLASS XVI.—*Monadelphica* contains 9 Orders, viz.

1. *Triandria*, having three stamens. *Aphyteia*,
2. *Pentandria*, „ five ditto. *Hermannia*, (a native of Africa.)
3. *Heptandria*, „ seven ditto. *Pelargonium*.
4. *Octandria*, „ eight ditto. *Aitonia*.
5. *Enneandria*, „ nine ditto. *Dryandra*.
6. *Decandria*, „ ten ditto. *Geranium*, (Crane's-bill.)
7. *Endecandria*, „ eleven ditto. *Brownea*, (a native of the West Indies.)
8. *Dodecandria*, „ twelve ditto. *Pentapetes*, (a native of India.)
9. *Polyandria*, „ many ditto. *Malva*, (Mallow.)

CLASS XVII.—*Diadelphia* contains 4 Orders, viz.

Orders.

Examples.

- | | | | |
|------------------------|----------------------|--------------------|------------------------|
| 1. <i>Pentandria</i> , | having five stamens. | <i>Monnieria</i> , | (a native of America.) |
| 2. <i>Hexandria</i> , | „ six ditto. | <i>Fumaria</i> , | (Fumitory.) |
| 3. <i>Octandria</i> , | „ eight ditto. | <i>Polygala</i> , | (Milk-wort.) |
| 4. <i>Decandria</i> , | „ ten ditto. | <i>Pisum</i> , | (Pea.) |
| | | <i>Ulex</i> , | (Furze.) |

CLASS XVIII.—*Polyadelphia* contains 4 Orders.

- | | | | |
|-------------------------|----------------------|--------------------|--------------------------------------|
| 1. <i>Pentandria</i> , | having five stamens. | <i>Theobroma</i> , | (a native of the West Indies.) |
| 2. <i>Dodecandria</i> , | „ twelve ditto. | <i>Monsonia</i> , | (a native of the Cape of Good Hope.) |
| 3. <i>Icosandria</i> , | „ twenty ditto. | <i>Citrus</i> , | (Orange.) |
| 4. <i>Polyandria</i> , | „ many ditto. | <i>Hypericum</i> , | (St. John's Wort.) |

CLASS XIX.—*Syngenesia* contains 6 Orders, viz.

- | | | |
|------------------------------------|--|---|
| 1. <i>Association æqualis</i> , | from the circumstance of all the florets being androgynous, that is, possessing both stamens and pistils. | } <i>Leontodon</i> ,
(Dandelion.)
<i>Carduus</i> ,
(Common Thistle.) |
| 2. <i>Association superflua</i> , | from the florets in the centre of the inflorescence being androgynous, and those of the radius or circumference possessing pistils only. | |
| 3. <i>Association frustranea</i> , | from the florets in the centre of the inflorescence being androgynous, and those of the radius or circumference being destitute of both stamens and pistils. | } <i>Centauræa</i> , (Blue-bottle, Knap-weed.)
<i>Helianthus</i> ,
(Sunflower.) |
| | | |

Orders.	Examples.
4. <i>Association necessaria</i> , from the florets of the central inflorescence producing stamens only, and those of the radius or circumference pistils only.	<i>Calendula</i> , (Marigold.)
5. <i>Association segregata</i> , not from any distinct character of association, but from the florets being separated from each other by means of many partial flowercups, (<i>perianths</i> ,) and these situated in a common Calyx.	<i>Echinops</i> , (Globe Thistle.) <i>Stæbe. Odera.</i>
6. <i>Association monogamia</i> , composed of simple flowers,* which have their anthers united.	<i>Viola</i> , (Violet.) <i>Lobelia</i> , (Cardinal flower.)

CLASS XX.—*Gynandria*. contains 9 Orders, viz.

1. *Diandria*, having two stamens. *Orchis*, (a native of Italy and Asia.)
2. *Triandria*, „ three ditto. *Sisyrinchium*, (a native of Bermuda.)
3. *Tetrandria*, „ four ditto. *Nepenthes*, (a native of Ceylon.)
4. *Pentandria*, „ five ditto. *Passiflora*, (Passion Flower.)
5. *Hexandria*, „ six ditto. *Aristolochia*, (a native of India and France.)
6. *Octandria*, „ eight ditto. *Scopolia*, (a native of Java.)
7. *Decandria*, „ ten ditto. *Kleinhovia*, (a native of India.)

The previous orders are all composed of compound flowers.

- | Orders. | Examples. |
|--|---------------------------------------|
| 8. <i>Dodecandria</i> , having twelve stamens. | <i>Cytinus</i> , (a native of Spain.) |
| 9. <i>Polyandria</i> , „ many ditto. | <i>Arun</i> , (Cuekow-pint.) |

CLASS XXI.—*Monœcia* contains 11 Orders, viz.

- | | |
|--|--|
| 1. <i>Monandria</i> , having one stamen. | <i>Chara</i> , (a native of England.) |
| 2. <i>Diandria</i> , „ two stamens. | <i>Anguria</i> , (a native of America.) |
| 3. <i>Triandria</i> , „ three ditto. | <i>Sparganium</i> , (Burr-Reed.) |
| 4. <i>Tetrandria</i> , „ four ditto. | <i>Morus</i> , (Mulberry.)
<i>Betula</i> , (Birch.) |
| 5. <i>Pentandria</i> , „ five stamens. | <i>Amaranthus</i> , (Amaranth.) |
| 6. <i>Hexandria</i> , „ six ditto. | <i>Zizania</i> , (a native of Jamaica.) |
| 7. <i>Heptandria</i> , „ seven ditto. | <i>Guettarda</i> , (a native of Jamaica.) |
| 8. <i>Polyandria</i> , more than seven do. | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle;"> <i>Fagus</i>, (Beech.) *<i>Sagittaria</i>, (Arrowhead.)
 <i>Corylus</i>, (Hazel.)
 <i>Quercus</i>, (Oak.) </div> </div> |
| 9. <i>Monadelphia</i> , having the filaments united at the base. | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle;"> <i>Pinus</i>, (Fir.) <i>Cupressus</i>, (Cypress.)
 <i>Thuya</i>, (Arbor Vitæ.) </div> </div> |
| 10. <i>Syngenesia</i> , having the anthers united. | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle;"> <i>Cucumis</i>, (Cucumber.)
 <i>Cucurbita</i>, (Gourd.) </div> </div> |
| 11. <i>Gynandria</i> , having the stamens growing out of a body resembling a pistil. | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle;"> <i>Agyneja</i>, (a native of China.) </div> </div> |

CLASS XXII.—*Diœcia* contains 15 Orders, viz.

Orders.	Examples.
1. <i>Monandria</i> , having one stamen.	<i>Nagus</i> , (a native of the European Continent generally.)
2. <i>Diandria</i> , „ two stamens.	<i>Salix</i> , (Willow.)
3. <i>Triandria</i> , „ three ditto.	<i>Osyris</i> , (Poet's Cassia.)
4. <i>Tetrandria</i> , „ four ditto.	<i>Liscum</i> , (Mistletoe.)
5. <i>Pentandria</i> , „ five ditto.	<i>Humulus</i> , (Hop.) <i>Caunabis</i> , (Hemp.)
6. <i>Hexandria</i> , „ six ditto.	<i>Dioscorea</i> , (a native of India.)
7. <i>Octandria</i> , „ eight ditto.	<i>Populus</i> , (Poplar.)
8. <i>Enneandria</i> , „ nine ditto.	<i>Mercurialis</i> , (Mercury)
9. <i>Decandria</i> , „ ten ditto.	<i>Carica</i> , (Papaw.)
10. <i>Dodecandria</i> , „ twelve ditto.	<i>Menispermum</i> , (Moon-seed.)
11. <i>Icosandria</i> , „ twenty ditto.	<i>Flacourtia</i> .
12. <i>Polyandria</i> , „ many ditto.	<i>Cliffortia</i> , (a native of the Cape of Good Hope.)
13. <i>Monadelphæa</i> , having their <i>filaments</i> united.	} <i>Juniperus</i> , (Juniper.)
14. <i>Syngenesia</i> , having their <i>anthers</i> united.	
15. <i>Gynandria</i> , having their <i>stamens</i> growing out of a body resembling a pistil.	} <i>Ruscus</i> , (Butcher's Broom.)
	} <i>Clusia</i> , (a native of Africa.)

CLASS XXIII.—*Polygamia* contains 3 Orders, viz.

Orders.	Examples.
1. <i>Monœcia</i> , having androgynous flowers, as well as flowers separately possessing stamens or pistils, but yet appearing on the <i>same</i> plant.	<div style="display: inline-block; vertical-align: middle;"> <i>Acer</i>, (Maple.) <i>Parietaria</i>, (Pel- litory of the Wall.) </div>
2. <i>Diœcia</i> , having androgynous flowers, as well as flowers separately possessing stamens or pistils, yet each appears upon separate and distinct plants.	<div style="display: inline-block; vertical-align: middle;"> <i>Fraxinus</i>, (Ash.) <i>Gleditsia</i>, (Three- thorned Acacia.) </div>
3. <i>Triœcia</i> , having androgynous flowers, as well as flowers separately possessing stamens and pistils, but so diversified and irregular in locality as to appear in some cases upon three distinct plants of the same species.	<div style="display: inline-block; vertical-align: middle;"> <i>Ficus</i>, (Fig-tree.) <i>Ccratonua</i>, (Carob Tree.) </div>

CLASS XXIV.—*Cryptogamia* contains 5 Orders, viz.

- | | | |
|----------------------|---------------------------|--|
| 1. <i>Filices</i> , | comprehending the various | <i>Ferns</i> . |
| 2. <i>Musci</i> , | „ | „ <i>Mosses</i> . |
| 3. <i>Algæ</i> , | „ | „ <i>Sea-weeds</i> . |
| 4. <i>Fungi</i> , | „ | { <i>Mushrooms</i> , <i>Lycoperdon</i> , |
| | | { (Puff Balls,) &c. |
| 5. <i>Hepaticæ</i> , | „ | „ <i>Liverworts</i> , &c. |

PART IV.

EXPLANATORY ILLUSTRATIONS

TWENTY-FOUR CLASSES.

MONANDRIA

Class I

Pl. III - 2

1.

Fig. 1



Fig. 2



Pl. III - 2



EXPLANATION OF PLATE III.

CLASS I.—*Monandria*.

FIG. I.

CANNA GLAUCA.—*Flowering Reed or Cane.*

- A. A. a. The Perianth.
- B. C. D. Depending divisions of the monopetalous Corolla.
- E. F. G. Other parts or portions of the Corolla.
- H. g. The extreme portions of the tube of the Corolla.
- I. The Anther attached to the edge of the petal f, which serves it in the place of a filament.
- K. The Stigma.
- L. The Germe, which is inferior (*Germen inferum*) and scabrous.

FIG. II.

Canna Indica, another species of the same genus.

- A. d. A. The Perianth.
- B. The Corolla.
- C. The Anther.
- D. The Stigma.
- E. The Germe.
- e. The persisting Stigma adhering to the germe.
- a. The germe enlarged into a pericarp, and which is now a Capsule (*capsula*.)
- b. The persisting Stigma.

EXPLANATION OF PLATE IV.

CLASS II.—*Diandria*.

FIG. I.

Cunila Maritima (Mountain Balm.)

- A. A. A. The Corymbs (*corymbus*), of flowers.
- B. The Perianth, without the Corolla, &c.
- C. The Perianth, with the Corolla, the two stamens and the pistil.
- D. The Perianth, with the pistil only.

FIG. II.

An American species of Speedwell (*Veronica*), the leaves of which are opposite (*opposita*), and sessile (*sessilia*.)

- A. A. The Spikes supporting the flowers, each of which has two stamens, and one pistil.
 - a. The Perianth, with the Corolla, before it has opened.
 - b. A posterior view of the Corolla, with its Perianth.
 - c. The Corolla, exhibiting the two stamens and one style.

FIG. III.

Collinsonia Canadensis (*Horse Weed*.)

- A. A. The two Corymbs (*Corymbus*.)
- B. The Corolla, which is somewhat ringent (*subringent*.)
- b. The Perianth.
- c. The Stigma, supported by its style, between the two stamens with their Anthers.
- d. The two Anthers, with the pistil between.
- E. The terminal Corymbus (*Corymbus terminalis*.)





EXPLANATION OF PLATE V.

*Containing Two Classes.*CLASS III.—*Triandria.*

FIG. I.

Commelina Virginica.—(A common North American plant.)

- A. The Calyx, which is a Spathe (*Spatha*), and is (*Cordata*.) Heart-shaped.
- B. b. The Petals.
- c. c. The three *Nectaries*, as termed by Linnæus; resembling cross-shaped Anthers (*Cruciforme*), situated upon their proper filaments. These would be more properly called infertile stamens.
- E. F. The Leaves, which are alternate (*Alternæ*), and Lanceolate (*Lanceolata*.)
- e. The Stigma.

CLASS IV.—*Tetrandria.*

FIG. II.

Ludvigia Alternifolia.

- A. A. The Stem, or ascending Caudex, from which proceed the leaves B. B. B. B.; these are generally alternate, and lanceolate (*lanceolata*); but the leaves of this species are not constantly alternate; sometimes the same plants protrudes both alternate and opposite leaves.
- c. One of the segments of the Calyx, which is a perianth and four-parted (*perianthium 4-partitum*.)
- D. D. The Corolla, which is tetrapetalous, or four-petalled (*tetrapetala*), contains four stamens and one style.
- e. The Capsule, invested by the Calyx.

EXPLANATION OF PLATE VI.

Containing Two Classes.

CLASS VI. — *Hexandria*.

FIG. I.

Lilium Canadense (Canadian Lily).

- A. A. Its six Stamens.
- B. The Style.
- C. C. The Corolla, which is six-petalled, and bell-shaped
(*Corolla campanulata*, 6 petala.)
- E. E. The Bractæ (Bractes.)
- D. One of its flowers unopened.

CLASS VII. — *Heptandria*.

FIG. II.

Æsculus parviflora.—(Horse-chesnut.)

- A. The Corolla, consisting of four petals, with seven stamens and one style.
- B. The Germe considerably enlarged, with the persistent style, after the fall of the stamens.
- C. C. Showing how, in the early age of the inflorescence, the stamens exist with only the rudiment of the pistil. This plant, therefore, ought to be arranged with the Class *Polygamia*.
- D. The Pericarp (*pericarpium*), considerably magnified, and which is three-valved (*trivalve*.)

The Seed, also considerably magnified, and which is, a nut (*nux*), distinguished by a very large hilum, by which it receives nourishment.

The leaves of this species of *Æsculus* afford a very good example of that species of compound leaf (*folium compositum*), which Linnæus calls a digitate leaf (*folium digitatum*.)





EXPLANATION OF PLATE VII.

*Containing Two Classes.*CLASS VIII. — *Octândria.*

FIG. I.

Rhexia Virginica.—(A beautiful North American plant.)

The leaves of which are opposite and sessile (*folia opposita, sessilia.*)

- A. A. The Calyx, which is a Perianth.
- d. A Corolla, yet unopened.
- b. D. The Pistil.
- B. B. The Corolla, consisting of four petals, and which are inserted into the Calyx.
- c. The Pistil, surrounded by the eight stamens.
- E. The vascular Calyx opened, and considerably magnified to show the position of the eight stamens F. The filaments are terminated by fulcated anthers (*Antheræ fulcatæ.*)
- G. The Germe.
- H. The Pistil.
- I. The Pericarp, crowned by the four points of the Calyx.

FIG. II.

Gaura Biennis.—(A common North American plant.)

- A. The Calyx.
- B. B. The four petals of the Corolla.
- C. C. The eight stamens.
- D. The Stigma, which is four-lobed (*4-lobum.*)
- E. A flower yet unopened.
- F. The Pericarp, which is a Capsule.

*Explanation of Plate VII. continued.*CLASS IX.—*Enneandria.*

FIG. III.

Different parts of the fructification of the *Butomus umbellatus* (Flowering Rush.)

- A. The posterior view of a Corolla.
- B. An anterior view of the same.
- C. The nine Stamens, the petals (or, as M. Jussieu terms them, the Calyx) being removed.
- C. The *Receptaculum* (receptacle).
- E. f. The same magnified.
- D. The six Germes magnified.
- F. A single Stamen, considerably magnified.
- G. An Anther, considerably magnified, in order to show its peculiar structure, which is bilamellate or two-plated (*anthera bilamellata*).



EXPLANATION OF PLATE VIII.

Containing Two Classes.

CLASS X.—*Decandria.*

FIG. I.

Cucubalus Stellatus.—(A very common plant, peculiar to the neighbourhood of *Philadelphia, North America.*)

- A. a. The Leaves, which are stellate (*folia stellata.*)
- B. b. Bractæ (Bractes.)
- C. The Perianth.
- D. The Stamens (ten in number.)
- E. L. The three styles.
- F. Showing the three styles detached from the other parts.

FIG. II.

- A. A. The ten Stamens, } Of the white Saxifrage
- B. The two Pistils, } (*Saxifraga granulata*).

FIG. III.

The *inflorescence* of the common Poke (*Phytolacca decandra.*)

- A. The flower of its natural size.
- B. The same magnified, showing the ten stamens, the striated germe, and ten stigmas.

*Explanation of Plate VIII. continued.*CLASS XI.—*Dodecandria.*

FIG. IV.

Asarum Canadense (Wild Ginger.)

- A. The Germe, below the Calyx, and hid within the substance.
- B. The Stellate, or star-shaped stigma (*stigma stellatum*), six-parted (*sex-partitum*.)
- b. b. Six of the twelve Stamens: the other six have been removed, for experiment, but the places which the filaments had occupied are made visible.
- c. A diagram showing the twelve filaments, as inserted on the top of the germe; the filaments are subulate or awl-shaped (*filamenta subulata*), with the anthers joined near to the centre of the filament.
- D. E. Two of the Stamens magnified.

FIG. V.

Agrimonia Eupatoria (Common Agrimony.)

- A. The flower of its natural size.
- B. The same magnified; the Corolla is five-petalled (*pentapetala*); the stamens are twelve, and the styles two in number.

FIG. VI.

Euphorbia Lathyris (Caper-spurge.)

The whole of these parts are magnified.

- A. The twelve Stamens.
- B. The Germe.
- b. b. The Styles.
- a. The six Stigmas.

Fig. 1



Fig. 2



EXPLANATION OF PLATE IX

Containing Two Classes.

CLASS XII.—*Icosandria.*

FIG. I.

Philadelphus Inodorus.

The Petals are four in number.

- A. The Calyx, &c. detached from the Petals.
- a. a. a. a. The Calyx, which is a Perianth monophyllous, or consisting of one leaf, but four-parted (*Perianthium monophyllum, quadripartitum*).
- b. b. c. c. The Stamens, which are numerous, and attached to the Calyx.
- d. The four Stigma.
- B. The Calyx, with the appearance of the Germe; e., after it is possessed of the Pollen.
- f. The feature or rather the rudiment of the Styles displayed, after the reception of the Pollen by the Germe.

*Explanation of Plate 1X. continued.*CLASS XIII.—*Polyandria.*

FIG. II.

- A. B. C. A flower, before it has opened, of the May-apple, called also Wild-Lemon, Mandrake; it is the *Podophyllum peltatum* of Linnæus.
- A. The Peduncle (*Pedunculus*).
 - B. The Perianth.
 - C. The Petals.
 - D. The expanded blossom, of its natural size; the Petals vary in number from six to ten; but the most prevailing number is six. The number of Stamens is very various.
 - E. A Stamen.
 - F. The Filament.
 - G. The Anther.
 - H. The fruit, which is a berry (*bacca*).
 - I. The persisting Stigma.
 - K. The Seed.



EXPLANATION OF PLATE X.

CLASS XIV. — *Dracopis*.

FIG. I.

Bartsia ~~Cochiana~~ (American painted Cup).

- A. A. A. A. A. A. The large and crimson-coloured Bractes (*Bractes*), which are more deeply coloured than the Corolla or the Calyx.
- B. B. B. The Perianth.
- c. A Perianth detached.
- D. d. The Corolla.
- E. A portion of the Corolla turned downwards, to show the four Stamens and the Style.
- F. The four Stamens, two of which are longer than the other two.
- G. The Pistil
- H. The Pericarp, which is a Capsule, two-celled (*capsula bilocularis*), and two-valved (*bivalvis*).
- I. The Capsule opened, exhibiting the locality of the seed.

FIG. II.

Gelastria *Flava*.

- A. The Corolla, which is monopetalous (*monopetala*), ringent (*ringens*), the limb (*limbus*) five-parted (*5-partitus*). The Stamens are four in number, two longer than the other two. There is one Pistil.

The Pericarp, which is a Capsule (*capsula*), seated in its Calyx, which is perianth, monophyllus, and five-parted; three only of which are exhibited in this drawing.

EXPLANATION OF PLATE XI.

Containing Two Classes.

CLASS XV.—*Tetradynamia.*

FIG. I.

Different parts of the *Cheiranthus Incanus* (Stock, or July flower).

- a. The six Stamens and the Pistil, of their natural size.
- b. The same magnified, four of the Stamens are long and two short, which is the character of this Class. The base of the shorter Stamens is surrounded with four nectariferous protuberances.
- c. The Corolla, which is tetrapetalous, four-petaled (*tetrapetala*), is also cruciform, or cross-shaped (*cruciata*, s. *cruciformis*).

CLASS XVI.—*Manuelphia.*

FIG. II.

Manuelphia.

The Filaments united into a single bundle ~~which~~, which is the characteristic of the Class *Manuelphia*.

The Pericarp, which is a capsule.

One of the cells of the capsule magnified.

A single seed magnified.

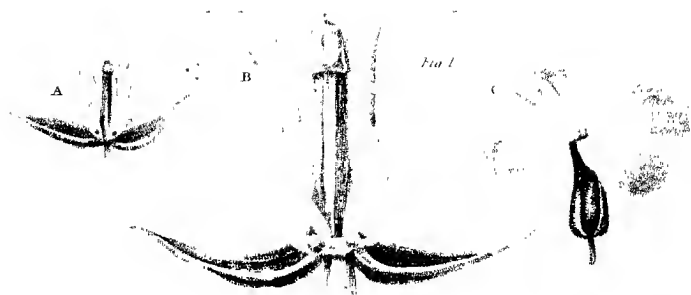


Fig 1 DIADELPHIA

Class 17

Fig 2 POLYADELPHIA

Class 16

P. 227



EXPLANATION OF PLATE XII.

*Containing Two Classes.*CLASS XVII.—*Diadelphia*.

FIG. I.

Robinia Viscosa, (a native of the southern parts of the
United States.)

- A. The Seed-vessel, which is a legume (*legumen*).
- B. The same opened, showing the two valves of which it consists, and the Seeds fixed along one of the sutures.
- C. An unmaturred Legume.

This plant furnishes a good example of the pinnate leaf (*folium pinnatum*), and of that species which Linnæus denominates *folium pinnatum cum impari*, unequally pinnate; when the wings, composed of leaflets, are terminated by a single leaflet.

CLASS XVIII.—*Polyadelphia*.

FIG. II.

Hypericum Kalmianum.

- A. The Corolla, which consists of five Petals, and the Stamens are distributed into several bunches.
- B. The Pistil in the centre.
- C. The Calyx, which is a Perianth, five-parted (*quinque partitum*), with the Pistil.
- D. The Capsule, with the Calyx attached to it.

EXPLANATION OF PLATE XIII

CLASS XIX.—*Syngenesia*.

First Order.—*Association Æqualis*.

Tragopogon Virginicum.—(Virginian Goat's-Beard.)

- a. The Amplexicaule Leaf (*folium amplexicaule*).
- b. The Stipules (*stipula*).
- c. The Calyx, with contained Corolla, &c.
- d. A posterior view of the Flower exhibiting the common Calyx
- e. The Corolla.
- e. The Stigmas.

A single Floscule,—f. the Petal,—g. the Cylinder of the Anthers,—h. the Style protruded through the cylinder of the Anthers.

- i. The Seed, with the Pappus, or Aigrette, attached to it.

SYNGENESIA

FIG. 1.



GYNANDRIA

Fig. 1.



EXPLANATION OF PLATE XIV.

CLASS XX.—*Gynandria*.*Passiflora Incarnata*.—Passion-flower.

- A. The three-lobed (*trilobum*), and serrated (*serratum*), Leaf.
- B. Another Leaf, but partially decayed.
- C. C. The two Glands, situated at the termination of the Petiole (*petiolus*), or commencement of the Leaves; it is from these Glands that Linnaeus forms his specific character of this species of *Passiflora*.
- D. D. Cirri, the Tendrils, or Clasps.
- E. The five-leaved Calyx (*perianthium pentaphyllum*), coloured, and resembling Petals.
- F. The Involucre.
- G. One of the five Petals of the Corolla, and which terminates obtusely and not in joints, as do the leaves of the Calyx.
- H. The Nectary (*Nectarium*), which is said "to crown the Corolla."
- I. The three Styles.
- J. The Germe, with the Stamens below, of which there are five, but only four appear in this drawing.
- K. One of the leaves of the Calyx.

EXPLANATION OF PLATE XV.

CLASS XXI.—*Monœcia*.

Sagittaria Sagittifolia.—(Common Arrow-head.)

- a. h. Uncolored pistilliferous Flowers.
- b. The Scape (Scapus.)
- b. The Bractes (*bractææ*.)
- c. d. Petioles which support the Sagittate Leaf (*Scitum sagittatum*.)
- e. One of the pistilliferous Flowers in perfection, exhibiting the three-lobed Corolla (*corolla tripetala*), and the Styles.
- f. The same, after the removal of the Petals, exhibiting the three-lobed Perianth (*perianthium triphyl-lum*), and the Styles.
- g. A posterior view of a pistilliferous Flower.
- h. The perfect stamiferous Flowers, exhibiting the three Petals and the numerous Anthers.
- i. A posterior view of the same.



EXPLANATION OF PLATE XVI.

CLASS XXII.—*Diacia*.

FIG. I.

The stamenerous plant of the *Acrida Cannabina*.

FIG. II.

The pistilliferous plant of the same.

- A. A. The Spikes (*spica*), of the flowers.
- B. A stamenerous flower, exhibiting the five Petals and the five Stamens.
- C. A pistilliferous flower, exhibiting the Perianth, with the Germe and five Styles.
- D. The Pericarp, which is a Capsule (*capsula*).

Explanation of Plate XVIII. continued.

Fig. 5. A detached individual of the same Moss, magnified considerably.

- A. The Stem.
- B. The Capsule, which Linnæus improperly calls an *Anthera*.
- C. The Calyptræ (*Calyptra*.)

Fig. 6. Another species of Moss considerably magnified.

- A. The Stem.
- a. B. The pendent Capsule.
- b. The Peristome.
- c. The Capsule, which is cylindrical.
- n. The Convex Opercule, or Lid (*operculum*), which covers the Capsule.
- E. The Calyptræ detached.

Fig. 7. The Capsule, &c. of the Moss represented in the preceding figure magnified by a higher power.

- A. The hollow part, which contains the powder.
- B. The solid base of the same.
- C. The Peristome, furnished with what assimilates to straight but narrow teeth.
- D. The Opercule.
- E. The ring of the Peristome.
- F. The naked Peristome.
- G. The Opercule detached.

Fig. 8. The fructification of a *Lichen*.

Fig. 9. The funnel-shaped fructification of a *Lichen*.

Fig. 10. The fructification of the genus *Marchantia*.

- A. The escutcheon-like or target-shaped fructification (*pelta*).
- B. Are cups which contain Corpuscles, or seeds, from which other plants are produced.

Explanation of Plate XVIII. continued.

Fig. 11. The fructification of the genus *Jungermania*.

- A. The tubulous sheath, embracing the Stem.
- B. The Stem.
- C. The Capsule, which is four-valved, and contains the seeds which are attached to that which has the appearance of elastic cords.

Fig. 12. A portion of the *Virginian Polypody* (or Stameniferous Fern). This is the true Dorsiferous Fern, the fructification being fastened upon the back of the Frond, by A. A., to two of which attention is drawn.

Fig. 13. The Order *Fungi*, *Clavaria Acrospermum*, represented of the natural size, and as growing upon old and dry timber.

Fig. 14. The same magnified.

Fig. 15. A. The *Pileus* or Cap.

B. The *Stipe*,* or Stalk.

C. C. The *Velum*, or Veil; a horizontal membrane, connecting the margin of the *Pileus* with the *Stipe*.

D. The *Volva*, or Wrapper; which originally was a bag or sack enveloping the whole plant, but was left at the foot of the *Stipe* when the plant elongated and burst through it.

E. The lower part of the *Stipe*.

* From the Greek of *στειπος*, a stake.

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PART IV.

EXPLANATORY ILLUSTRATIONS OF THE TWENTY FOUR

CLASSES 247

ADVERTISEMENT.

THE original intention of publishing "*The Boudoir Recreations in Botany*," consisting merely of about twenty or thirty Illustrations in quarto, and which were to have appeared in the spring of 1836, was abandoned for the present work; but Mrs. Perkins having been solicited to continue the subject in its higher departments, she has, under this flattering circumstance, to announce for publication, early in May next, "*Physiological Researches in Botany*," with *twenty highly engraved Plates, to contain nearly three hundred Illustrations.*

EXPLANATION OF FRONTISPIECE.

CLASS V.—*Pentandria*.

FIG. I

Nicotiana Tabacum (Common Tobacco.)

- A, A. Perianth
- B The Corolla before it has expanded.
- C. The Tube of the Corolla.
- D. The Border of the Corolla, injudiciously termed Limbus.
- F. The Swollen Germe enveloped by the Perianth.
- E, E, E The Bractæ (Bractes)
- G. The Tube.
- H. The Corolla cut open, to exhibit the Stigma H, surrounded by its five Anthers.
- I. The Pericarp opened
- K. The same horizontally cut.

FIG. II

A *Species of Convolvulus*, from *Florida*.

- A. The Perianth.
- B. The Tube of the Corolla.
- C The Corolla, exhibiting the Stigma and its five Anthers.

PREFACE.

“And he spake of Trees, from the *Cedar Tree* that is in *Lebanon* even unto the *Hyssop* that springeth out of the wall.”—1 *Kings*, iv. 33.

THE votary of the delightful science of Botany beholds order and contrivance where the uninformed spectator sees but the splendor of colour; and the direct tendency of so edifying an occupation is to lead the mind to contemplate the adorable perfection and goodness of HIM who has bestowed so much of grace and art even upon the inanimate and insensate objects of his creation.

No department of Natural History more strongly evinces the existence of a *Supreme Cause* than the study of the vegetable world;

the simplicity and harmony of which are well calculated to elevate, while they delight the mind:

“ But not alike to every mortal eye
Is this great scene unveil'd. For since the claims
Of social life to different labours urge
The active powers of man; with wise intent
The hand of *Nature* on peculiar minds
Imprints a different bias, and to each
Deerees its province in the common toil.
To some she taught the fabric of the sphere,
The changeful moon, the circuit of the stars,
The golden zones of *Heaven*: to some she gave
To weigh the moment of eternal things,
Of time, and space, and fate's unbroken chain,
And will's quick impulse: *others by the hand*
She led o'er vales and mountains, to explore
What healing virtue swells the tender veins
Of herbs and flowers, or what the beams of morn
Draw forth, distilling from the clefted rind
In balmy tears.”

Pleasures of Imagination.—Book i, 79—97.

To the female mind, Botany offers a study peculiarly appropriate and delightful. The objects to which it relates are immediately around us; they are among the loveliest of Nature's works, and it is an additional recommendation of the pursuit, that its effects are alike beneficial

to the corporeal and mental system; for, while the understanding and the taste are gratified, the health is improved and the constitution invigorated.

It is the purpose of this work to present an Introduction to Botanical Science, according to the system of Linnæus; but care has been taken to divest that system of certain repulsive excrescencies which have operated, not merely to the injury of that system, but even to the detriment of the science itself. This is greatly to be regretted: Botany ought not to be held accountable for the bad taste of its professors. Properly expounded, it is a study perfectly unexceptionable, and, in addition to being harmless, it is in various ways positively useful.

We see in it our dependance upon the vegetable world for the ordinary purposes of life, for food and raiment, and even for the means of preserving and restoring the most valuable of all blessings, health.

The study, liberally pursued, comprehends a knowledge of the names and uses of plants, of their external and internal organization, of their

anatomy and physiology; of the modes by which this beautiful clothing of the earth is sustained and renewed; of the laws that regulate the dispersion of seeds and the location of species; and of the influence which climate exercises upon their development.

To these there is yet to be added the inducement which the study holds out to the many who Professor Rennie describes as having "more leisure than they know well how to get rid of;" and to such it must be a matter of no small moment that they endeavour to alleviate, if they cannot remove, their real or supposed cares, by increasing the sources of innocent enjoyment; and, were it for this reason only, Botany ought to stand high in our estimation.

INTRODUCTION.

THE announcement of a new elementary work upon Botany, while so many previously exist, may appear presumptuous and unnecessary; but it is hoped that the present attempt is not open to either imputation. It is true that many works exist of established reputation and considerable merit, but a majority of them are little adapted to the tastes or the capacities of the young; and, from another cause, many are peculiarly unsuited for the perusal of female youth. It is for this description of readers that the present volume has been compiled; and, as simplicity of arrangement was obviously desirable, it has been carefully kept in view. Independently of this, much interesting matter, not generally found in a work purporting to be simply elementary, has been given; while all the exceptionable analogies

by which Linnæus supported his system have been excluded; and so much of the physiology of the subject as could not be explained without them has here been considered as beyond the pale of female study.

To avoid the tendencies above alluded to, and yet to stand upon the Linnæan system, has been the aim of the writer of the following work. The novelty of her position, and the difficulties by which it is surrounded, are obvious. She has felt the latter to be even greater than she anticipated, and nothing but the fullest conviction of the necessity that such a task should be performed has encouraged her to persevere. With the exceptions which have been made, she believes the system of Linnæus to be the best, from its originality, its distinctness, its easy application, and, lastly, though designated artificial, from its being, in fact, a more natural arrangement than the so called system of Jussieu or of any other writer.

Since no natural science can be thoroughly understood from theory alone, it is matter of just surprise that hitherto there should have

been no elementary work in which a general mode for *practically studying Botany* is laid down. The Authoress, therefore, has arranged a model from which cases of instruments are in progress of being made, adapted for the boudoir, the garden, & the fields, by which the allurements to a minute knowledge of the subjects of botanical science may be materially facilitated; thus a new field, replete with objects worthy of cultivation, is presented; and, with much sincerity, it is hoped that it may supersede some of the less important, not to say superficial studies, in the education of many of our sex in the present day.

These instruments will be sold only by the publisher of this volume. Each purchaser will be entitled to a Card of Admission to one Lecture on the uses and the mode of applying the several instruments, which will be delivered at the Publisher's, every Wednesday and Thursday morning, from twelve to two.

DIRECTIONS TO THE BINDER.

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ERRATA

Page,	Line,	
1,	17,	Omit "which."
4,	4,	<i>read</i> "was <i>that</i> of the Marquis," &c
119,		Last word in note, for "stane," <i>read</i> stare."
199,	4,	for "Polypetalous," <i>read</i> "Pentapetalous"
240,		Omit 4th Order, Class XI, in a few copies.

THE
ELEMENTS OF BOTANY.



THE
ELEMENTS OF BOTANY,

WITH ILLUSTRATIONS.

BY MRS. E. E. PERKINS,
PROFESSOR OF BOTANICAL FLOWER PAINTING.

PATRONIZED BY
HER ROYAL HIGHNESS THE DUCHESS OF KENT,

AND

DEDICATED, BY EXPRESS PERMISSION,

TO

HER ROYAL HIGHNESS THE PRINCESS VICTORIA.



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BY THE DISTINGUISHED HONOUR
OF
A DIRECT PERMISSION,
THIS VOLUME
IS, WITH THE MOST PROFOUND RESPECT AND GRATITUDE,
DEDICATED TO
HER ROYAL HIGHNESS THE PRINCESS VICTORIA,
BY
HER ROYAL HIGHNESS'S
MOST DEVOTED, OBEIENT,
AND VERY HUMBLE SERVANT,
THE AUTHORESS.

London, February 15, 1837.

